REPORT RESUMES

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NATIONAL DEFENSE EDUCATION ACT OF 1958, AS AMENDED, TITLE III, ANNUAL REPORT-FISCAL YEAR 1966. PART III, NARRATIVE REPORT, SCIENCE.

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THE EFFECTIVENESS OF TITLE III OF THE NATIONAL DEFENSE EDUCATION ACT IN THE IMPROVEMENT OF SCIENCE INSTRUCTION IS CONSIDERED. INFORMATION FROM THE ANNUAL REPORTS OF STATE DEPARTMENTS OF EDUCATION IS DISCUSSED. CATEGORIES OF INFORMATION INCLUDE (1) CURRICULUM, (2) TEACHER EDUCATION, (3) EQUIPMENT, MATERIALS, AND FACILITIES, AND (4) STATE LEADERSHIP AND EVALUATION. THE STATE SCIENCE SUPERVISORS WERE UNANIMOUS IN THE VIEW THAT TITLE III OF THE NATIONAL DEFENSE EDUCATION ACT HAD IMPROVED SCIENCE INSTRUCTION BY PROVIDING IMPETUS FOR LOCAL SCHOOL DISTRICT PERSONNEL TO EVALUATE AND MODIFY THEIR INSTRUCTIONAL PROGRAMS. SUPERVISORS ALSO INDICATED (1) A GREATER EMPHASIS ON ELEMENTARY SCIENCE PROGRAMS, (2) AN INCREASING AWARENESS FOR NEW TEACHING APPROACHES, (3) INCREASED USE OF LABORATORY EXPERIENCES, AND (4) MORE EFFECTIVE INSERVICE EDUCATION. EVIDENCE IS PRESENTED THAT INDICATES THE NATIONAL DEFENSE EDUCATION ACT TITLE III HAS LIAISON BETWEEN LOCAL EDUCATIONAL AGENCIES AND TEACHER PREPARATION INSTITUTIONS. (AG)

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National Defense Education Act of 1958, as Amended

Title III

Annual Report - Fiscal Year 1966

Part III - Narrative Report

SCIENCE

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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SE 000 923

SUMMARIES OF THE STATE SUPERVISORS ANNUAL REPORTS ON SCIENCE

NDEA Title III Narrative Reports Submitted by State Departments of Education in 1966

This collection of summaries and quotations is intended to give a brief overview of the evidence offered by the States as to the effectiveness of Title III of the National Defense Education Act on the improvement of instruction and to describe some particularly productive activities of State specialists supervisors. Because a complete report is not feasible, only the most significant items have been selected. The format of this summary includes four categories of information derived from the 1966 Annual Report Forms:

I. Curriculum

II. Pre- and In-Service Education

III. Equipment, Materials and Facilities

IV. State Leadership and Evaluation

Fifty States, the District of Columbia and outlying areas, submitted narrative reports or NDEA Title III indicating a variety of activities in science. All States and outlying areas are now committed to science supervision for the improvement of science education.

The reporting States were unanimous in the view that instruction in science has improved as a result of NDEA Title III funds. All States agree that NDEA provides the impetus required to encourage local district personnel to begin to evaluate and modify their instructional programs. All indicate that an increased number of science programs have been improv and updated in either one or more of the categories described. All of the reporting States commented upon the value that has been realized from the improvement in instruction in science through the NDEA Title III programs.

As in the past, science has received the greatest share of Title III funds - almost half of the States allotments - even though NDEA Title III continues to encompass a greater number of subject areas.

The leadership role described by the State science supervisors indicates greater emphases on elementary science education programs, more attention to the newer approaches in the teaching of science on all levels, increased laboratory experiences and more effective in-service education.

NDEA Title III also had its impact on pre-service education programs and on encouraging greater liaison between local educational agencies and teacher-training institutions. State leadership in science has stimulated the development of local leadership which, in turn, has acted as a catalyst in improving teacher education on a grass-roots level.

Curriculum:

Science teachers are using a wide range of teaching and instructional methods in their classrooms. Methods ranging all the way from individualized instruction to team teaching expedite the learning process. Student project work is one such teaching method that encourages the individual to launch out into problem-solving situations. Many teaching methods take advantage of the latest equipment and materials of an audio-visual nature.

High school science students participating in regional fairs and in the Junior Academy of Science show improvement in the quality of both science projects and scientific papers. Professionals in the biological and physical sciences who serve as judges at science fairs and on committees that evaluate scientific papers are impressed by the progress being made each year.

The science section of the elementary course of study was developed with the assistance of many teachers was tested by them prior to publication and distributed in fiscal 1966.

The consultants discussed with science teachers, at both the elementary and secondary level, the implications for curriculum change to coordinate the elementary and secondary course of study or adapt them to the needs of students in the school systems throughout the State. Through newsletters, conferences and inservice meetings the consultants inform and encourage those schools interested in initiating or changing advanced science courses or adapting regular courses to the needs of special students.

The consultants compiled and distributed one newsletter during the school year 1965-66. This is attached to the report. It is hoped that two may be produced during the coming year. The consultants assisted in developing material for the Alabama Course of Study Grades 1-6 which was distributed during the year. Plans are being made to develop one or more resource units or study guides on special topics in junior high school science.

Education:

During the summer of 1966 200 science teachers in Alabama attended seven National Science Foundation Institutes. These Institutes range from the junior high school level to those dealing with multiple science fields on the high school level.

Teachers are also increasing their competencies through inservice education where they share ideas and have opportunities to see effective demonstrations of successful teaching methods. Teachers' workshops provide opportunities for work on improving various aspects of the curriculum. Other workshops are aimed toward improving the subject matter competencies of teachers in a given area. Most of the workshops are conducted on the local system level. The State-wide Alabama Educational Television network airs science courses on a regularly scheduled basis. This enables science teachers throughout the State to observe good science teaching methods and to analyze their effectiveness in their own classrooms. Many local school systems have developed curriculum libraries where teacher reference materials are maintained for use by the science teachers.

Conferences with college personnel indicate some progress in the strengthening of science requirements in the preservice education of teachers. One college reports "the two 3-hour general science courses required of education majors have been replaced by four 3-hour physical science courses which include astronomy, chemistry, physics and geology." One large State university now offers a composite science major requiring 48 semester hours in biology, chemistry, physics and earth science. No minor is offered in composite science as it is felt that it would not be a worthwhile offering. This school offers majors in specific sciences of biology, chemistry, or physics requiring 26 semester hours in the major science and 10 or more hours in additional mathematics and science courses. Another large university now requires 43 semester hours for a major in one of the science fields. Teachers continue their science studies by taking advantage of special institutes and workshops. Approximately 200 Alabama science teachers are currently registered in NSF Institutes in the State.

About 70 teachers have had training in aerospace workshops. The consultants have worked with about 900 science teachers in inservice meeti and workshops during 1965-66.

The consultants confer with NSF Institute directors, furnish them lists of science teachers and visit the Institutes while they are in progress. The Alabama Academy of Science gives assistance to the science teachers through sponsorship of the Visiting Scientist Program, the Regional Science Fair Program and the Alabama Junior Academy of Science Program. One of the consultants arranges the schedule of the NASA Spacemobile which was shown before 47,000 children and teachers this year. Next year this group plans to provide workshops for elementary teachers in addition to the lecture-demonstration program. The consultants have conferred with two doctoral candidates who are working on studies in the area of science education. The consultants have met several times in planning sessions with educational television directors and ETV science teachers as well as participating in television programs explaining the work of the NDEA Title III consultants and science course offerings.

Equipment, Materials and Facilities:

Schools are improving their science instructional facilities by providing laboratory furniture and equipment sufficient for a realistic program of laboratory instruction. The laboratory creates an environment where students may explore and discover relationships for themselves, thus developing increased interest and desire to learn more. Audio-visual materials and materials designed for teacher demonstrations are in wide use throughout the local school systems. Each year the number of schools in the State that could be considered adequately equipped for quality science teaching increases.

In past years the State has adopted textbooks on a single adoption basis. Now science textbooks are being adopted on a multiple basis providing local school systems with a choice of some of the best texts available; for example, this past year seven junior high science series were State adopted which incorporate the latest developments in science curriculums nationally. Other experimental course materials are being used by various local school systems on a trial basis. Teaching has been strengthened through the purchase of reference materials from the Title III master list of eligible books. Each year new books are examined, evaluated, and added to the master list. This insures that the reference materials selected for purchase are of good quality and make a definite contribution toward improving science teaching.

An estimate of the percent of adequacy of the science equipment installed and in use in the junior and senior high schools over the State is as follows:

20% of the high schools adequately equipped for individual work

40% of high schools equipped for laboratory work in pairs.

10% of junior high schools adequately equipped for individual work

25% of junior high schools equipped for laboratory work in pairs

Evaluation:

Student achievement reflected in Alabama freshmen profiles from the ACT Tests of the colleges and universities indicate higher ratings over previous years in the natural sciences. Guidance directors, deans, and registrars at the various State colleges report an increase in the number of students that are being placed in advanced science courses upon entering college.

Surveys of all the State accredited high schools show that the number of students taking science courses above the junior high school level is increasing.

Curriculum:

A curriculum guideline for science grades 1-8 was developed by a group of twelve teachers selected throughout the State, an "outside" consultant and the science and mathematics consultant of the State Department of Education.

Education:

The State leadership role was improved considerably by the addition of a full time consultant for science and mathematics in the latter part of the fiscal year.

It is anticipated that the science and mathematics consultant will be able to make many more site visits to the local educational agencies and provide assistance in curriculum development, improvement of teacher education and inservice programs as well as assist the local educational agencies in the utilization of all the State's resources, publications.

Equipment, Materials and Facilities:

A total of $63,511 was approved for forty projects specifically for science.

The amounts of money approved was $17,170, $20,159, and $25,982 for the elementary, secondary and combined elementary and secondary grades respectively. About eighty-four per cent of the approved amount was for equipment with approximately forty-three per cent for audio-visual equipment and forty-one per cent for other than audio-visual equipment. The remaining seventeen per cent of the approved amount went for instructional materials with approximately nine per cent for audio-visual instructional materials and eight per cent for other printed instructional materials.

Evaluation:

It is safe to assume that the student achievement was positively affected by the additional opportunity for increased achievement through the use of the materials and equipment provided through the science projects.

Although seventy-five per cent or more of the elementary students in the public schools in Alaska attend school in local educational agencies that have one or more science projects under Title III, NDEA only about twenty per cent of the elementary school students in the public schools have adequate equipment and materials to provide them with daily practical experience. The secondary situation is considerably better with approximatel fifty per cent of the students being provided with adequate daily practice experience.

Title III NDEA has provided a tremendous amount of impetus toward the strengthening of science instruction over the past years.

ARIZONA

Curriculum:

"The improvement in results in our science subjects has been remarkable. There is greater motivation of students, and they are evidencing a greater interest in science as a means to an end, rather than as a potentially interesting subject to arouse mild curiosity.

Science Congresses were activated through four institutions of higher learning. Additional science fairs and other science youth activities for the State were also carried out.

Through N.D.E.A. Title III, science equipment procured provided the opportunity for classes of students for the first time to experience in-depth understanding of the processes of science. Library reference materials and films and filmstrips procured provided the opportunity for students to study vicariously those areas of study which did not lend themselves readily to classroom experimentation. The evidence of the success of the program cannot be judged by objective tests alone. Seeing classes of students in all grades studying with the realia of science and apparently enjoying their experiences appears to be the best evidence we have of the program's success.

Equipment purchased for use in this area was limited to those larger audio-visual items which made it possible to teach a better science course within the self-contained classrooms of the district.

Education:

Workshops were conducted at the individual schools on grade level in the use of equipment and techniques of presentation. Teachers were receptive to the workshops and a total of 42 were conducted in the 12 elementary schools of the district.

Twenty-six inservice institutes were directed. These were conducted at the local level and consist of curriculum planning, implementation of new equipment, science youth activities, and designing new science installations or remodeling projects. In addition, the Science Consultant wrote a science section for the N.D.E.A. Title III Newsletter and helped organize the Math-Science Conference directed by the State Department of Public Instruction for teachers and administrators of the Arizona schools. In the high school we used most of our funds in equipping laboratories in a new science addition. Antiquated equipment was discarded and replaced by new and modern items geared to modern needs of our students. Through use of this equipment, our teachers, most of whom have had recent training in NSF Institutes, were able to put into practice the procedures and concepts developed in these centers. Title III monies were spent in the science area to provide laboratory facilities and materials, and science reference materials. The program developed with the use of these materials provided for individual student work in the laboratory. However, such a program required a new approach by teachers. Additional preparation and planning were necessary; the result, however, was a science program which attracted children and provided great opportunity for learning.

Many teachers in this district have taken advantage of extension and resident center college classes offered in this area, and the most popular classes have been those that deal with the teaching of science. We feel this teacher interest is due to the availability of the new equipment."

Equipment, Materials and Facilities:

District Audio Visual Library had a total of 87 films in seven areas of science, many of which were quite out-dated. Science equipment was lacking in all grades and equipment for the projection of audio visual materials was in great demand by teachers. With participation in N.D.E.A. the school district film library was increased to 267 films in the seven areas of science. Equipment for projection of audio visual materials was provided.

Within the three primary population centers of Arizona approximately 90% of the students participating in the laboratory courses are provided with an individual investigative atmosphere. These procedures of the investigative technique have worked their way into the elementary levels during the past three years since the advent of the multiple science text adoption. "The course offerings in science were expanded and enriched with advanced classes in biology and chemistry. In general, more students were able to individually experience laboratory situations due to additional equipment; such as microscopes, ovens, and incubators. This equipment was above the normal budgetary allotments. More students took the advanced placement examination due to the expanded and enlarged science program. Outdated and obsolete equipment was replaced with modern science equipment. Overhead projectors were made available to teachers to present interesting materials in the science classes.

The visual aids to be used in the field of biology is one area of emphasis closely related to the audio-tutorial system now being developed. The equipment used to photograph and prepare materials for slides to be presented with tape recordings, which may be used by students at their convenience and as often as they wish, was made possible only through the use of N.D.E.A. Title III purchases. Since instructors attended summer institutes in which they were able to prepare materials and explore the audio-tutorial approach. Some curriculum changes and improvements are under way for this coming year.

Through the use of N.D.E.A. funds we were able to equip our instructional center to fulfill the increasing demand on supplementary materials used in grades one through eight. There were many audio-visual aids and materials purchased in order to meet the individual needs ofthe student in the science curriculum. Since science laboratories are not available in the elementary buildings, teachers must provide demonstrations and group experiments through the use of audio-visual equipment. Using overhead projectors, bioscope micro-projectors or film projectors, the classroom is converted into a science laboratory.

In science approximately 30% of the funds went for individual equipment and materials. Approximately 30% of our funds were expended in this at both the elementary and secondary levels. For the first time the Mesa Schools have been able to develop science laboratories in two of the elementary schools. Individual work in science has been increased tremendously. At the elementary level, the desire of the schools to employ the investigative technique in the area of science from K through 8 is on the increase.

The equipment and materials that were obtained by using N.D.E.A. funds made it possible to give all students more laboratory experiences and to give the teacher a more favorable atmosphere to conduct science demonstrations.

Evaluation:

"It was interesting, and very satisfying, to note that when the Metropolita Achievement Tests were administered in May of 1966, in practically every building the science scores were the highest in the over-all battery. We feel the improvement is directly connected with the use of our new equipment.

ARKANSAS

Curriculum:

A science newsletter providing information on publications and curricular developments K-16 has been disseminated.

At an elementary principal's workshop (ASCD), more than fifty examined new approaches in science education.

Education:

The supervisor showed evidence of improved teacher preparation in citing the following activities dealing with pre- and in-service education.

- 100 teachers attended NSF Institutes
- 300 teachers attended elementary school workshops
- 500 students participated in science education career programs

Equipment, Materials and Facilities:

Approximately 75% of the high schools are adequately equipped for the programs now provided. Materials and facilities are far from adequate in the elementary schools. Improvement at both levels continues, however, through use of NDEA funds. During the year plans were drawn for the development of new facilities in thirty-two high schools. As new programs are developed, this trend will probably continue.

Curriculum:

State department specialists in science point to what they consider to be improved teaching techniques, more creative and stimulating learning situations, and improved and expanded laboratory equipment, as documented through the applications for NDEA funds approved by the State.

Materials for science teachers and students along with a program in science, grade K-12, have been developed.

Education:

Twelve workshops and a symposium were held for various areas of science instruction on the junior college level--astronomy, biology, chemistry, engineering, geology, physical science, and physics. Some 1,800 teachers participated in these.

Supervisory services were also provided for numerous meetings and conferences of professional groups concerned with the improvement of science instruction, including organizations of the administrators, curriculum coordinators, and science teachers.

An estimated 10% of the high school science teachers of the State had opportunities for improved learning as their teachers participated in in-service programs in which at least some assistance was provided through NDEA during this past year.

Equipment, Materials and Facilities:

The State department consultants indicate that many exemplary projects and innovations may be identified in local school districts within the state. NDEA support has contributed to them, and while science supervisors have served as consultants in some instances, most of these projects have resulted from local initiative.

COLORADO

Curriculum:

A survey by Colorado schools indicates an increasing trend towards a laboratory approach in teaching science at all levels. Schools in Jefferson County, Boulder, Greeley, and Colorado Springs are among those trying new approaches in either the AAAS Elementary Science or the ESI Elementary Science Study Programs. A Title III ESEA project in Boulder is examining critical thinking and creativity in elementary science. A survey showing what programs are being taught in Colorado schools in science and mathematics indicates the classroom environment to some degree. Since programs like PSSC Physics, CHEMS Chemistry, IPS, etc., are included, this report also reflects trends, enrollment by subject area, and implications for inservice and pre-service education in Colorado.

Education:

The supervisory efforts have emphasized pilot projects in Introductory Physical Science and the Earth Science Curriculum Project for junior high teachers. Two-day workshops and inservice training have been organized and conducted by the science consultants. Particular attention has been focused on second order or carry-over effects to show implementation of these programs into the school curriculum.

A life science inservice program sponsored by the Colorado Department of Education trained 43 junior high teachers for a seventh grade life science program developed by the Jefferson County schools. Other workshops and inservice programs for teachers, either conducted by the Department of Education or jointly sponsored, include among the highlights:

1. Earth science workshops (two days) at Craig, Grand Junction, and Gunnison.
2. Physical science workshops at Durango, Grand Junction, and Rifle.
3. ESCP inservice course (11-week) at Jefferson County.
4. About 24 demonstrations.

An action group made up of the metropolitan science supervisors and science educators of nearby colleges and universities meets once each month in some joint effort to solve such problems as inservice education, pre-service education, laboratory safety, and the like.

Equipment, Materials and Facilities:

The use of the laboratory in elementary schools is increasing through the use of kits in a self-contained classroom. While only about 15 per cent of the elementary schools actually have laboratories, this use of individual kits does provide an opportunity for the pupils to have direct interaction with the materials. The secondary schools of Colorado are heavily committed to the curriculum projects in the science areas. Estimates showing adequate facilities and a program where pupils spend at least 50 percent of classroom time in laboratory work are as follows:

Program	Level	Percentage in Lab	Adequate Facility
Physics	H.S.	54%	72%
Biology	H.S.	63%	74%
Chemistry	H.S.	43%	70%
General Science	J.H.S.	30%	69%
Physical Science	J.H.S.	77%	78%
Earth Science	J.H.S.	76%	73%
Other Science Programs	Secondary	26%	70%
	Elementary	20%	15%

Much of the NDEA Title III fund available to Colorado continues to be spent for the installation and remodeling of laboratories for science programs. Approximately 50 percent of the materials and equipment in science that were requested on Title III, NDEA, projects were actually purchased because of limited amounts of federal funds available for use to Colorado districts during 1965-66.

Curriculum:

The usage of materials developed by the large curriculum projects increased in 1966. Most Connecticut senior high schools are now using some of these materials. There was an increase in interest in the several curriculum projects concerned with elementary science, with a number of school systems using some of the materials so far developed.

An advisory committee was established to help identify appropriate areas for attention in improving science education. This committee gave high priori to elementary science as an area in need of help. Toward the end of Fiscal 19 plans were developed for beginning the development of a curriculum guide in elementary science. A group of seven science supervisors from Connecticut school systems was convened for three full days to discuss and suggest guidelines for such a curriculum guide.

During the fiscal year, the consultant continued the traditional role of advisor to local school systems on a variety of problems. He was able to give service in somewhat greater depth because of the availability of more time.

Education:

It is fair to state that in Fiscal 1966, the consultant in science education in Connecticut spent a larger portion of his time in professional and leadership activities than at any time since the passage of the National Defense Education Act.

Equipment, Materials and Facilities:

There is no question but that there has been an increase in the adequacy of equipment and materials for an effective instructional program in science. It is probably that an improvement of 5% to 8% is a reasonable estimate of the progress for the year. This would mean, if the estimates for Fiscal 1965 were reasonably accurate, that the adequacy of equipment and materials in elementary schools may be 30 - 35% and in secondary schools 55-65

Evaluation:

NDEA has helped to create a climate favorable to good facilities. Existing facilities have been improved in many schools through such changes as installation of light control for better use of audio-visual materials, modernization of laboratory furniture and installation of storage units. It should be noted that library resources, for science on the average, have been greatly improved in the last few years.

Improvements in elementary science lag behind those in secondary science in Connecticut. As yet, no program has been devised nationally or specifically for Connecticut, to give help to teachers in the massive amounts necesæary to change elementary science teaching greatly and quickly.

It should be emphasized that 100% adequacy is an extremely difficult condition to attain in science. Each year brings the need for different instructional materials and equipment just to keep pace with the changing nature of science.

For the forseeable future, there must be substantial expenditures for instructional apparatus and materials in science. There is no forseeable possibility of reaching a point where further expenditures are not needed. Much contact with administrators, teachers, and supervisors of science and visits to many schools provide the basis for asserting that progress toward improved experience in science for Connecticut students continued in 1966.

Education:

Greater professional enthusiasm was developed, among teachers K-12, more interest in the new curricula, was engendered in teachers of science, as well as a much closer identification of purpose between public, private and parochial schools. These objectives were realized through inservice workshops at various levels, professional meetings and liaison between industry, higher education and this office.

Efforts have been directed to make more use of the National Science Foundation Programs in training key personnel of the elementary and secondary level who will act as the prime movers for their districts in science. Ten such teachers were selected this year for such programs. Selection was determined through the aid of the superintendent, the principal and the State Department to determine that person who would best fulfill this need. Teachers in chemistry, anxious to increase their proficiency in their field, will be involved in an inservice workshop which will be held in all three counties of Delaware during the academic year 1966-67. This workshop, using CHEMS as the program, will attempt to develop a common base toward which all teachers will aim.

A workshop has been designed to encourage the use of natural resources in Delaware. This program, involving 30 teachers, elementary and junior high, was developed as a teaching-doing program. The teacher spent the morning in class developing the theory; the afternoon consisted of trips where the theory was verified and put into actual practice.

Equipment which is needed to augment individualized instruction comprised 83 per cent of the total expenditure. This expenditure has been reflected by the desire of science teachers to improve their teaching efficiency through inservice institutes. National Science Foundation programs and other activities which focus increased classroom proficiency inservice workshops have increased sharply at the elementary level. Approximately 270 elementary teachers were involved this past year. This is in contrast to one held in fiscal 1965, which involved eight teachers. It is anticipated that the next academic year will involve an even greater number. Five such programs are being considered at this time.

Equipment, Materials and Facilities:

At the elementary level, the concentration on audio-visual apparatus, books and the fourth highest expenditure, television sets, suggests a "let's-look-and-learn" attitude rather than one of doing. Inservice workshops at this level should be instrumental in mitigating this trend. The secondary level spent $14.00 on equipment for every dollar spent by the elementary in that same category. In contrast, the elementary spent $4.00 on television for every dollar at the secondary level and $2.40 for every dollar at the secondary level on books.

Teachers at the elementary level hesitate to use individualized instruction and substitute audio-visual equipment and materials, television and books in its place. In the case of television, expenditures in this category exceeded equipment by thirty per cent; with books it was only eighteen per cent less. This hesitancy implies a need for inservice workshops and the encouragement of districts to use the new curricula.

This effort will begin in September, 1966 with five workshops at the elementary level. Two of these, one in conservation education and one using AAAS materials, will be carried out this summer.

From the analysis of the equipment and materials purchased, the best estimate of the percent of adequacy in science at the secondary level is thirty. This is rapidly increasing and may be ascertained by analyzing the equipment and materials list and noting the types of items that have been ordered. School districts are, in the main, ordering equipment in quantity; this suggests that increased individualized instruction is taking place. Books, although described as becoming increasingly more frequent on NDEA, Title III lists in science at the National Conference of State Science Supervisors in Austin, involved only $5,138.00 or little more than one percent of the expenditures. It, again, points up the trend of ordering equipment for increased individualization.

Curriculum:

The inservice work with teachers of Honors Biology at 9th grade level has produced results. Test scores from a final biology exam given on a city-wide basis indicates the students are achieving at or above the national norms. Data on these scores are available from the office of the Assistant Superintendent of Secondary Schools.

Education:

In-service science programs for teachers in the Model School Division has resulted in numerous classes showing great reading improvement where science was given emphasis. Reading test scores of students seemed to be higher than normally expected. Equipment and supplies made available and used by teachers contributed to this progress.

Equipment, Materials and Facilities:

Daily practice experience at elementary level is probably less than 10% effective by observation of staff. Far too little equipment and supplies support the equipment purchased are available. We are approaching 100% adequacy at the secondary level in providing daily practice experience in science. Poor teacher training is a major drawback to adequacy, but equipment is now available.

Equipment requests for support of biology instruction based on several years of inservice work with the teachers have nearly all been met. The majority of candidates for teaching positions in science have heard little about the new curricula materials available or about the support for equipment made available through NDEA.Colleges seem to be doing poorly in preparing teachers for their teaching responsibilities with the new curricula materials.

Curriculum:

The major part of the science effort was directed toward the development of a defensible science program. This is done to offset the tendency to order from standard lists or follow the suggestions of a salesman.

Above and beyond the three per cent of time spent in local project planning is also used in working with local and Statewide groups on the development of educational specialists.

Expanded offerings and new programs which are laboratory-experience centered were given greater focus on the assumption that the specific equipment and facilities needed in these programs would insure more careful development of NDEA projects on the local level.

A grant was obtained from the National Science Foundation to provide selected junior high youngsters who were in the seventh grade to undergo a series of experiences from BSCS biology. During the second year the group which took BSCS biology will be taking CHEM Study. There are eighty youngsters involved in the program and a study is being made of these youngsters with a selected control group. NDEA special project money was used at one time for the evaluation portion of the program. The plan calls for these youngsters to take BSCS biology the first year, CHEM study chemistry the next year, PSSC physics the following year, a special course in instrumentation the following year, and then move into the laboratory research program during their junior and senior years.

The summer program in Orange County is outstanding. At present there are four separate operations going on such as lecture series, a laboratory centered workshop for junior high school youngsters, a laboratory centered workshop for senior high school youngsters and an individual student research program.

The program in Martin County High School represents a program wherein a small school has used NDEA equipment and government surplus property to a distinct advantage. At the present time they are teaching BSCS biology and PSSC physics and involved in CHEM chemistry on a limited basis. Initial efforts are being made here for the establishment of a marine science program on the high school level.

Sarasota County has been successful in implementing a great many changes in program. One feature of this program is the summer institute in Marine Biology held for science teachers and high school students. This institute has been established under a grant from the National Science Foundation.. The County has also become heavily involved in the AAAS Elementary Science Project centered at Florida State University.

Education:

Probably 1 to 2% of the budget of supervisory services was related to inservice training programs in science. $3100 was spent directly and indirectly for this purpose.

NSF institute participants were not called together as a specific group nor directly singled out for use in any specific program. They were made use of on the local level and at conferences in discussion groups and particularly in the sessions dealing with the development of educational specifications.

The personnel in the graphics and audio-visual department provided many related services at a professional level which contributed to the presentations which were made and aided in the effective interpretation of ideas and concepts.

Sponsorship for the inservice sessions was for the most part a cooperative arrangement between the State department of Education, Florida State University and the Board of Regents Office for Continuing Education. Approximately 3% of the elementary teachers were involved in the AAAS training program and another 7% were reached in conferences or workshops. Others were reached through the elementary and science supervisors. On the secondary level about 10% of the science teachers were directly involved in activities sponsored at this level and another 20% were reached indirectly through work with other supervisors.

During November of 1964 the Earth Science Curriculum Project was established in Orlando. Four schools from Orange County and one in Seminole County are now in the test center for the Earth Science Curriculum Project material. The response from the teachers, students and other involved has been enthusiastic.

Efforts to include money in budget for inservice training program specifically operated by this office other than these made possible by use of Special Projects money. Funds were included in the budget to establish a series of 12 planning conferences for consultants and 12 two-hour workshops each week following a planning conference.

Equipment, Materials and Facilities:

Even though minor remodeling is declining and funds spent for items involved in new construction are increasing, it would appear that facilities of a more adequate nature are being provided throughout the State.

The recent emphasis on "alphabet" courses is doing much to offset the use of general equipment in the requiring of specialized laboratory equipment in their implementation.

Teachers, principals, and supervisors were encouraged to use the facilities of the Science Education Center at Florida State University. The "center" idea is still developing at the University of South Florida. At every opportunity the idea of developing a set of educational specifications stressing the need for planning facilities, materials and equipment in terms of a specific program were promoted.

Minor remodeling is becoming less evident as a factor in projects. The records show that over the years 1959-65 the allocation for remodeling, with science and modern foreign languages receiving the bulk of the funds, has declined as follows: 9%, 2.6%, 9%, 3.3%, .01%, .6% and .2%.

A new set of State standards were distributed during 1964-65 throughout the state.

Commercial exhibits are encouraged at regional and state-wide meetings of supervisors and science teachers. Demonstrations of equipment are scheduled when possible. The greatest problems in this area are:

(a) There is such a mass of items and materials appearing that a total review is impossible.

(b) Keeping up with new items is difficult.

(c) Time is just now available to do follow-up on purchase for various projects and know what has actually been purchased at the local level and make enough observations to learn from the teachers whether or not they are getting quality merchandise.

(d) The man hours necessary to attend to this overall problem are not available.

Evaluation:

A study of the impact of Title III of the NDEA program "The Impact of NDEA Title III Funds on Instruction in Florida Public Schools," was conducted by Dr. D. Grant Morrison of Associated Consultants in Education. Inc. located in Tallahassee.

The major part of the follow-up and evaluation of NDEA projects was informally done as work on other problems in individual counties progressed. Discussions were held with science coordinators, supervisors and other instructional personnel either as individuals or in groups on the impact that the NDEA program has had in their schools.

The Motivation and Depth Program under the direction of Dr. Milton Saslaw has been involved in the planning and implementation of this program from the very start. NDEA special project funds used in this program in the evaluation portion one year and FFFS funds were used last year.

The enrollments in PSSC physics have been increasing over the years. A significant number of additional teachers have availed themselves of BSCS training in the past year. Enrollments in BSCS biology have increased.

There are a number of additional courses other than Biology II such as Anatomy and Physiology, Bacteriology, Advanced Placement Biology, Marine Biology, Botany, Microbiology, Radiation Biology, Science or Lab Research and Zoology with a combined enrollment of 4,219 which are biologically oriented. This combined with Biology II makes an overall enrollment of 4,219 which are biologically oriented. This combined with Biology II makes an overall enrollment of 8,619 in a second year program in biology.

Thus far the PSSC physics, CHEMS and all three versions of the BSCS biology textbooks have been selected by the State Textbook Committee to be added to the State adopted list.

Offerings in science show a definite increase both in variety and enrollments throughout the State. For instance the Junior High science enrollments have increased.

GEORGIA

Curriculum:

The best single source of evidence that the teaching of science has improved during the years since the passage of the National Defense Education Act has been a recent statement from a professor of Chemistry at the University of Georgia who stated that students entering that department are more capable to do creditable work at the University than ever before. Similar statements are made or reported from most colleges within the State.

There has been no significant change in the percentage of students enrolled in laboratory centered courses such as BSCS, CHEMS, or PSSC in the senior high school during the past year. There is, a genuine increase in experience centered teaching of science in the elementary and junior high school years. Specifically, there has been more than a 500% increase in the number of students enrolled in earth science courses While these may not all be laboratory oriented, the reason most frequently given for introducing these courses to the junior high school curriculum is to provide field and laboratory experiences for students at these levels.

The guide to elementary science instruction Science For Georgia Schools w revised two years ago and distribution of the revision was begun in the fall of 1965. Demand for the revision was so great that supplies were exhausted within just a few months. A second printing was done during the early months of 1966 and is now being distributed to fill back-ordered requests.

Education:

State science consultants conducted ten workshops of one to ten days dura in addition to assisting in seven workshops on college campuses. A genuine interest has developed during recent months in providing science supervisors in local school systems. Nine local school systems now employ fifteen science consultants. This represents an 88% increase in the number of local science supervisors in Georgia schools.

Equipment, Materials and Facilities:

The extent to which science equipment provides to all students of science the experience of learning by discovery through individual work in a laboratory is determined by the predisposition of teachers and other school officials to make it so. In those school systems where this predisposition exists there is never enough equipment. There are constan new avenues which must be explored which require different sorts of equipment. These people, so predisposed, utilize gleefully the materials provided by NDEA Title III and plan eagerly for improvements to be made with subsequent years' allotments. As a gross estimate only about fifteen or twenty per cent of our secondary schools and less than ten per cent of our elementary schools provide for learning by discovery in field or laboratory situations.

The building standards guide for school laboratory construction was revise during the year. New standards call for larger minimum laboratory space, proper and safe storage of materials, preparation rooms, and recommends provision of space for independent student study and laboratory work.

HAWAII

Curriculum:

At the elementary school level, the elementary teachers are moving into the direction of having pupils work with objects and phenomena in laboratory investigations. There is less emphasis in reading about science.

Every science course in the secondary schools from grades 7 to 12 stresses the laboratory approach and the learning of science through inquiry and discovery. A junior high school science guide is being developed which emphasizes the importance of open-ended laboratory investigations, quantification of data and use of class data to detect a central tendency in phenomena.

A good number of elementary and secondary schools conducted school science fairs and exhibits to stimulate interest in science and to offer opportunities for talented pupils to pursue topics of interest.

Education:

Four in-service summer workshops were held in August 1965 for about 650 elementary science teachers with Dr. Abraham Fischler, Mr. Frank Salamon, and Dr. Herbert Thier as resource leaders. Objectives of the workshops were to give teachers an understanding of teaching of science as inquiry and to update skills of teachers in laboratory technique and investigation.

About 400 elementary teachers were given 64 hours of inservice training in elementary physical science by Professor Iwao Miyake of the University of Hawaii at weekend or summer workshops sponsored by the Hawaiian Telephone Company to update their knowledge and obtain added experience in the laboratory skills.

A summer institute to develop the leadership of science chairman so that they may be more effective in their responsibilities as science specialists at the school level is planned for August 1966 with Dr. Paul Hurd as science resource leader.

The NSF Summer Science Institute at the University of Hawaii enrolled about 50 secondary science teachers in a BSCS Yellow Version Biology course and in a course on Earth Science.

Meetings were held with the Committee on Teacher Preparation at the University of Hawaii to revise science pre-service training of teachers. The emphasis is to involve teachers in laboratory activities so that they will be competent in this phase of teaching.

Committees were assisted in the examination of local science curricula and suggested areas for revision and development. Several school science committees produced school science syllabi to achieve horizontal and vertical articulation of science in the schools.

Equipment, Materials and Facilities:

The acquisition of equipment and other materials of instruction enabled science teachers to involve pupils with more firsthand observations and laboratory investigations. Classrooms are equipped with more teaching aids as reference books, science filmstrips, student equipment, charts, and demonstration equipment. Classrooms in elementary and secondary schools are placing greater emphasis on the purchase of student equipment. Classrooms are about 25 to 35% adequate in science equipment to provide pupils with opportunities for individual involvement in laboratory investigations. Materials as filmstrips, projectors, reference books are about 60 to 75% adequate.

Classrooms are about 50 to 75% adequate in student equipment. Materials as filmstrips, books, projectors, charts, etc., are about 60 to 75% adequate.

Curriculum:

Much of the credit for the improvement in the teaching of science can be traced directly to the acquisition program and the supervisory and related services program of Title III of NDEA.

The general reaction of college personnel is that students entering the colleges and universities have a greater breadth of preparation in the sciences than was observed prior to NDEA. There have been some criticisms that this preparation in breadth does not give the students the preparation in depth which colleges deem highly desirable. The selection of students for special youth programs in the sciences shows that more students each year are showing improved preparation in all the sciences. Papers submitted for presentation at various youth science activities improve each year as the teachers gain experience in guiding students in individualized work and science research projects. The conditions which influence learning have actually improved within the State during the past year. There is a greater emphasis on selection of materials for use by individual teachers. More school districts are considering the new curriculum studies and are becoming more interested in utilizing methods emphasized by these curriculum studies.

Education:

Cooperative efforts were developed in conservation education whereby numerous State and Federal agencies have appointed members to a State Advisory Committee on conservation education. This committee will act in an advisory capacity through the State science consultant to the State Board of Education. A publication will be issued by the Statewide science teachers association through the State consultant announcing new programs and giving items of interest to science teachers throughout the State.

A most signficant change in the improvement of State level consultative services is that the position of the consultant in science took place at the beginning of the 1967 fiscal year will be a full-time responsibilit

Equipment, Materials and Facilities:

Due to the impetus provided by NDEA, Title III, the per cent of adequacy of equipment at the elementary level is 15; it is 35 per cent at the secondary level. Adequacy of materials at the elementary level is 25; it is 30 per cent at the secondary level.

Generally, equipment purchased under Title III of NDEA is more appropriate to good science education than that which was purchased in prior years. This is due to several factors, among which are the involvement of teachers to a higher degree in the preparation of project applications, and the experience gained in prior years in the purchase of equipment. Through the activities of the colleges and universities in cooperating with the State consultant in science, programs have been developed to give inservice training to teachers and bring them up-to-date in the utilization of new science techniques, teaching equipment and materials.

ILLINOIS

CURRICULUM:

Since most curriculum materials in elementary science (except for the AAAS Process Approach) still consist of isolated units of work rather than a sequential course, few elementary administrators are enthusiastic about formally adopting any of them for general use. Educators have been trying to lure teachers away from dependence on a single textbook for decades, but as long as the self-contained classroom predominates elementary school organization, the proponents of a multiple resource approach seem unlikely to prevail. The best possibility of positive results the new programs have at this time would seem to be in establishing widespread teacher awareness that science consists of something beyond the mastery of facts, figures, and descriptions. If a more open-minded attitude becomes general among grade school teachers, willingness to employ innovative materials may eventually precipitate a new era in elementary science with almost unlimited possibilities.

Junior high school science is rapidly becoming more sharply departmentalized throughout Illinois. As teachers in the seventh, eighth, and ninth grades become accustomed to regarding themselves as science specialists, they are actively seeking more effective and more challenging course materials. These instructors are perhaps the most enthusiastic and open-minded in school science today, unencumbered by traditional conceptions of course structure or content, eager to experiment with unconventional approaches, and anxious to kindle the latent imagination of students. Most textbook companies seem to favor a Life Science, Earth Science, Physical Science sequence.

There is tremendous interest at the moment in the Introductory Physical Science course produced by PSSC and published by Prentice-Hall. Surprisingly this rather demanding material is most often taught to average and below-average ninth grade students and seems well within the capacity of nearly all of them to master.

The senior high school program has already experienced the excitement of a curriculum revolution which introduced PSSC, CBA, CHEMS, and BSCS to challenge traditional publishers and inject new vigor as well as new subject matter into somewhat apathetic science teachers. Now that the violent turmoil has subsided, teachers are unquestionably better prepared and more alert, and the materials they have available today are certainly superior to any in print before 1960 in providing student interest, firing the imagination, and encouraging creativity. Open-ended experiments, multiple sources of content, frequent recourse to the laboratory, supplementa enrichment material, and greater opportunity for individual student inquiry or investigation may be found in most secondary science programs, whether the school is officially committed to the curriculum study courses or whether the teachers are evolving composite courses of their own incorporatin innovations with more traditional texts. The curriculum groups have achieved one avowed purpose: they have demonstrated the superior value of employing imaginatively presented content and individual student involvement to explore a field of inquiry rather than merely to examine and analyze its current structure.

The complete programs released by the study groups have not proved as universally attractive as many educators had predicted. The impact made by the courses is conspicuous and salutary; the formal adoption of their texts and materials is increasing steadily but rather slowly.

Education:

The directors of state-sponsored workshops were the only related services personnel engaged to extend the effectiveness of regular science consultants and actually compensated for their efforts from Title III funds. It would be physically impractical and financially extravagant to have staff members conduct between 30 and 65 workshops each year, at locations scattered throughout a state roughly the size of England, and to have them return to each one every week for ten consecutive weeks. Instead, consultants worked through the County Superintendent of Schools and local districts to schedule workshops, secured the best available science teachers as directors, interviewed and oriented these temporary staff members, arranged for the delivery of necessary equipment and materi and visited each workshop only two or three times to observe how it was proceeding and offered suggestions to the director. In the course of sponsoring workshops for seven years, the office has accumulated a growing list of qualified and particularly effective directors who repeatedly engage and maintain the cooperative attention of participating teachers. When a new workshop is planned, the director is chosen from this list as often as possible.

Without the assistance of these related services people, state science consultants would be forced to ignore other commitments and obligations or limit the inservice program to perhaps five or ten workshops per year. Furthermore, by identifying competent science teachers and by introducing them to large numbers of unspecialized local teachers, the staff is able to provide hundreds of smaller districts with ready access to understanding resource people within convenient contact distance.

The science staff also directed or conducted 73 county and local workshops institutes, or formal conferences lasting two days or less. Each was individually planned to meet the needs of a particular group of science teachers, and there was considerable variation in format, purpose, content and number of participants. When sessions took more than two hours, consultants tried to arrange matters so that each attending teacher had an opportunity to engage in laboratory activities which could be incorporated in regular science classes. Content was chosen from a wide range of locally identified subject matter with special current interest and included such things as aero-space problems; newer aspects of earth science; concepts and student investigations appropriate for introductory physical science courses; and examples of practical approaches employed by other schools to initiate student laboratory work at the elementary level.

A total of 26 elementary workshops for teachers in grades K-6 were arranged and supervised by the science staff last year. Each one had ten weekly sessions of 150 minutes duration and followed procedures established in effective prior programs except for a few minor details. Essential equipment and material was furnished by Title III which also compensated the director and furnished participants with copies of the handbook written by science staff members. As before, approximately two-thirds of each meeting was planned to allow participants to perform individually selected laboratory experiments or demonstrations for themselves, with a qualified instructor nearby at all times to answer questions or render necessary assistance. This particular program was designed primarily to help teachers who might otherwise be inclined to avoid using simple equipment and materials and to teach elementary science as a modified reading or discussion course ABOUT science.

An orientation meeting held in April, 1966 for junior high school science teachers interested in the Introductory Physical Science course (developed by PSSC and published by Prentice-Hall) was held at the Holiday Inn in Rockford, Illinois. Seventy-three science teachers attended at their own expense to hear a state consultant, an experienced IPS teacher, and others discuss and explain the program. Representatives from both equipment companies authorized to produce IPS apparatus set up displays, and the representative from Prentice-Hall provides each teacher with a text and teacher's guide. As a result of the interest shown in this program, three special IPS workshops will be sponsored by Title III. The first of these will begin August 22, 1966, at the Washington Junior High School in Rockford, and will continue for five full days. It will give participants an opportunity to try most of the major laboratory procedures in the course, using IPS authorized equipment and materials. The other two workshops will be held in DuPage County during the first semester of the 1966-67 school year. They will meet one night each week for ten consecutive weeks and will follow a program still under development by science consultants and IPS teachers. If these workshops prove successful, similar ones may be held downstate during the second semester. A proposal to develop a special workshop program based on the ESCP course has since been received by the State Office and is still under consideration. Providing the present surge of interest in junior high school programs continues unabated, a larger percentage of future inservice workshops may be reserved for teachers at that grade level.

Good physical science teachers, capable of handling such unorthodox courses as IPS, are now in short supply. A special program to train them has been started at the Chicago Circle Campus of the University of Illinois.

A new series of four junior high school workshops was begun in Region I last year. These programs were devoted to the development of a locally adapted curriculum based on available materials in Life Science, Earth Science, and Physical Science. A special committee for the recruitment of physical science teachers has been formed by Frank O'Neal of the

State Teacher Certification Board. Its members include physics and chemistry professors from thirteen Illinois colleges and universities as well as others interested in science education, and Harold Prehn from Title III is representing the consultant staff. This group has proved to be unusually energetic and productive during the first four months of its existence and several projects it has started could help to accomplish results the science consultants have sought for many years. A majority of the professors are active in professional physics or chemistry organizations and have secured promises of cooperation from three of these in promoting campaigns to increase the number of prospective high school science teachers. The committee has already secured a panel of twenty-seven university professors who have volunteered to speak to science teachers at county institutes. It is preparing a table of modified certification requirements for science teachers which there is every reason to suppose will be favorably received. Members have volunteered to prepare at least two articles for the January 15 issue of the Illinois Journal of Education which will be devoted entirely to science and which has been assigned to the Title III staff for organization and completion.

Universities are suffering from a shortage of physics teachers, and they are alarmed by a recent survey which indicates that 99% of all college students who enroll (not major) in physics took at least one year of physics in high school. High school physics classes become smaller and fewer each year, and if the present trend continues, may disappear entirely for lack of instructors within the foreseeable future. One possible solution is a modification of state certification requirements and undergraduate university programs to create a new classification, the physical science teacher. This program would permit an undergraduate student to divide his major field between chemistry and physics, rigorous aspects of both subjects. The new physical science teacher would be much better prepared to present junior high school physical science courses than a vast majority of the teachers are today, and he would be as well prepared as many high school teachers now are to teacher at least one year of either chemistry or physics. If he later undertook graduate work, he could devote full time to chemistry and acquire an excellent general background; or, he could take both mathematics and physics and acquire the equivalent of an undergraduate major in pure physics. Industry would not accept him as a physicist until he had a graduate degree, and by that time he would have sufficient teaching experience to qualify for a salary comparable to that offered by industry. This suggestion may not advance the hopes of professional scientists for continually better prepared physics teachers, but it might save the high school physics program from ultimate and inevitable extinction.

Science consultants are in close and frequent contact with education faculty members at every state-supported college or university and with educators interested in teacher training at many of the privately financed institutions in Illinois. The ultimate objective of this informal interaction is the improvement of science teaching in elementary or secondary schools, but the topics discussed on specific occasions cover various aspects of science education.

The science consultants have been moderately successful in convincing teacher training directors that the teaching of science should involve material objects and apparatus, not just books, pictures, and audiovisual material; that every prospective teacher should have some personal experience in a laboratory if he expects to do a creditable job of teaching science at any grade level; that science, even at elementary levels, must be presented as something more than the mastery of previously determined facts, figures, explanations, and classification schemes; and that students of all ages can learn a great deal more by actually performing certain selected procedures themselves than by hearing about what others have done or by watching a teacher do them. For more than six years now, the Handbook for Elementary Science Workshops prepared by Illinois consultants has been reproduced in quantity and made available without cost to everyone immediately engaged in teaching education classes or in taking courses related to the teaching of science. Any regular student, extension student, or teacher enrolled in a college or university sponsored inservice institute can obtain at least one copy. Any college level instructor who indicates the intended use of the Handbook can secure multiple copies in any reasonable quantity.

Five issues of the ILLINOIS SCIENCE NEWSLETTER were written and distributed to all public schools in Illinois, all regularly listed parochial schools, many private schools, and a limited list of other educators.

Equipment, Materials and Facilities:

Since a sizable number of science projects were deferred for lack of funds and since later approval may not permit some schools to arrange scheduling of laboratory remodeling or installation originally planned for this summer, it is impossible to predict the result of Title III changes this year on the future trend of laboratory improvement. High school laboratories have rapidly increased in number and steadily improved in quality each year since NDEA began to function. Simultaneously, however, the laboratory usage required by high school science courses has also increased and the total high school enrollment has gone up as fast or faster than new buildings erected to accommodate it. Even though the elementary and junior high schools have installed greater numbers of laboratories every year, it is estimated that only one of these schools in three is equipped with adequate modern facilities today. It will be many years before the anticipated rate of laboratory installation makes a significant change in the total number needed and causes a clearly discernible reduction in the importance of NDEA assistance.

Changes in the NDEA program, however, encouraged diversion of funds as well as concentration from science needs by adding English, reading, history, geography, civics, and economics to the list of critical subjects. Within a few months of this enormous expansion of NDEA coverage, schools were told that related acquisition funds for 1966-1967 would be substantially reduced. It is exceedingly difficult to comprehend the logic responsible for simultaneously enlarging the scope of a program and for substantially reducing the appropriation requested for both the original and the new subjects during the very next year. Whatever the motivation for this apparently contradictory action, the result has had serious implications for the future of the science program in Illinois.

If requested appropriations for Title III, NDEA, continue to follow the pattern set this year, the only feasible answer to an equitable distribution of funds would appear to be some system which would assign each school district a maximum total allotment for all critical subjects together, leaving decisions relative to individual department quotas to the local superintendents. This sort of arrangement would almost certainly assure nearly complete participation in the NDEA program by all local districts, and the maximum allotment would accordingly be very small for any single year. The logical consequence would be the necessary abandonment of any program calling for a major investment at any one time, or, specifically, the elimination of major laboratory installations. Since few science curriculum changes can be implemented without the addition or expansion of laboratories, the science improvement program would be effectively removed from further financial support.

The Office of Education must take positive action to assure continuance of the laboratory improvement program within the foreseeable future or accept the fact that science instruction may gradually disappear from smaller school districts.

Evaluation:

The most disturbing situation mentioned was the almost complete isolation in which many colleges, universities, and large school districts plan programs for training elementary science teachers; it would appear that content revision is commonly decided without consulting any outside source. Even within one large university, it seems that as many as three or four professors may teach different sections of a teacher-training science course (or science methods course) without investigating what other members of the faculty are doing. Only four university people had ever observed in detail what was taught in elementary grade science classes of any school other than the university laboratory school. Few universities appeared to show active interest in improving the training of elementary science teachers once they have received a degree and left the university. Few offered subject matter science courses specifically designed to help elementary teachers. Other universities would require a teacher to take at least one course in biology, chemistry, physics, geology, astronomy, and perhaps one or two other independent sciences. Finally, it seems that science methods courses are usually taught without requiring teachers to participate in any laboratory work at all.

Results of the August conference have begun to appear in several ways. Professors from at least three of the universities have continued to maintain contact and exchange ideas. Several methods courses taught by participants now include at least a few weeks of laboratory work, although this might admittedly have come about for other reasons. One university filed an inservice summer institute proposal aimed specifically at upgrading elementary teachers, and while the request was not granted, the research effort in preparing it has since appeared in a series of articles. The Illinois Academy of Science reactivated a division devoted to the improvement of elementary science teaching at its April meeting. A state consultant was invited to explain the reason for the Title III inservice workshop program, and other speakers discussed measures which might help solve the same problem.

Two science educators have been working with Harold Prehn and Edward Brattrud of the science staff to formulate an effective pilot workshop for next year which will include laboratory work from ESS or AAAS study units (or possibly others) and will suggest to inservice teachers how these and other recently evolved materials might be incorporated in traditional programs.

One institution has assigned two laboratory personnel to work with staff consultants in preparing a slightly different type of laboratory oriented elementary workshop, this has been projected for pilot presentation later this year or early next year.

Active participation in this conference it has already placed the science supervisors in close communication with university personnel who were previously difficult to reach. Furthermore, it has helped to strengthen the working relationship between the Title III Science Program, the Teacher Certification Board, professional physics and chemistry organizations(compose largely of university teachers), and a number of additional colleges and universities which are seldom encountered through regular channels.

Again last year, staff consultants participated to some extent in the regular recognition-evaluation visitations conducted by Regional Supervisors. The maximum number of such visits made by any one consultant was limited to ten following a series of conferences between Title III, representatives of the Office of Education, and the Assistant Superintendent in charge of recognition activities.

It is feared by the staff that any increase greater than this will almost certainly cause other equally important phases of the science program to be unduly curtailed. Consultants concede the advantages of employing subject matter specialists as members of evaluation teams and are willing to cooperate as long as participation is limited. They feel, however, that if schools should begin to regard Title III consultants as probable members of any future recognition group, the demand for them as program advisors or resource people would accordingly diminish.

When consultant participation in recognition-evaluation visits remains a minor part of usual activity, these visits can be beneficial to all concerned. Science specialists concern themselves exclusively with science departments, and they try to visit districts which have made little use of their services in the past. After visiting a large number of classrooms representing most levels of the local program, they prepare a concise report with recommendations and suggestions for improvement which will almost automatically be considered by the Board of Education. This has often proved to be a simple and efficient way to promote coordinated multi-grade courses of study; to encourage local adoption of improved courses developed by NSF sponsored curriculum groups and others; to encourage the installation of new laboratories and the remodeling of outmoded ones; and to bring additional pressure to bear on teachers who need further subject matter preparation, who consistently neglect to revise outdated courses, or who consistently resist the development of modern, well-articulated course sequences. If consultants on teams limit their comments to suggestions for strengthening science programs, leaving decisions about the assignment of recognition status to the Regional Supervisors, they should experience little difficulty in reconciling a small number of these visits with their regular duties in the Title III organization.

Consultants are expected to visit all approved laboratory projects within their respective regions during the semester following completion, prior to reimbursement whenever feasible, to be sure that inferior items or workmanship were not substituted after final authorization. In addition, each consultant must also visit a minimum of ten participating districts within his region each year to verify the presence, location, condition, and use of all identifiable items costing $100 or more on which the school received some reimbursement from the Title III program. Less expensive items are spot-checked to conserve time. The consultant making the verification prepared a written report in which he listed all completed projects, detailed major items, noted any items which were missing or inaccessible to science teachers, noted items which had reduced effectiveness because of poor maintenance, and called attention to any irregularities or poor practices observed. While there, he was expected to recommend better ways of utilizing any equipment which had inherent instructional potential beyond that already recognized and in evidence at the school. A carbon copy of the veritification report was given to the local superintendent and the original was placed on permanent file in the Title III office. Last year, Illinois science consultants made 866 personal visits to 607 schools. The overwhelming majority of these calls were related in some way to the acquisition program: 365 involved helping to plan an equipment or materials project which did not require substantial alteration of facilities; 174 were connected with the proposed remodeling of present laboratories or the installation of new ones; 168 were for purposes of follow-up or evaluation (including 86 visits to schools in 43 counties for comprehensive equipment verification reports); and while the others were immediate purposes of curriculum revision, inservice training, and a variety of other matters, most of them should eventually result in the purchase of additional science items once planning has been completed and proposed changes have taken place.

All Title III departments have a common Advisory Committee composed of university faculty members, County Superintendents of Schools, District Superintendents, and occasionally other educators who have special qualifications or assignments. It meets with all subject matter consultants at least twice during the year to discuss workshop programs, acquisition standards, special problems, and changes of policy.

One committee has already obtained authorization from the State Office to proceed with a proposal for a summer training plan for Illinois physics teachers, to be submitted to the National Science Foundation under its Cooperative College School Science Program for school system improvement. A contingent benefit for Title III consultants is the fact that this NSF proposal will necessitate several surveys of science enrollments and science teachers which the staff has sought for several years but has not succeeded in obtaining clearance to conduct.

One science consultant is on a special committee primarily composed of chemists and physicists who are actively attempting to increase the number of prospective science teachers by offering assistance to secondary school science programs. This group is also devoting considerable time to find out what is being done in elementary science classes and to do something constructive about changing it. The professional education people are helpful in working out details of such things as workshop programs, institutes, and special inservice conferences, and are in a position to bring about immediate change in the structuring of science methods courses. The specialized scientists are showing great promise of accomplishing positive results in other ways: by causing changes to be made in certification requirements, by devising new subject matter sequences for the benefit of science teachers, by providing qualified specialists in specific sciences to speak to teachers at county institutes, and by securing volunteers from colleges and universities who will be available to visit schools where they can work directly with science teachers and science students.

An all day inservice planning conference was held at Eastern Illinois University in Charleston in August, 1965. State consultants and 23 specially invited guests representing six state colleges and universities, several local districts with outstanding science programs, and two schools serving as trial centers for new curriculum programs, discussed present workshop organization in detail and considered suggestions for improving and extending its potential value to local school systems. The information which emerged from the conference probably more than justified the expense of bringing these people to Charleston, and the combination of direct and indirect results since then would suggest that similar programs in the future might ultimately exert a significant influence for the betterment of elementary science instruction in Illinois.

Curriculum:

At the secondary level the number of schools teaching BSCS materials (particularly the yellow and blue versions, along with the special materials and second year materials) will be greatly increased during the coming year. The schools using the PSSC, CHEM Study, and CBA materials will not change drastically; if anything the number will probably diminish as other texts have now incorporated many of the concepts that were initially unique to these materials. The number of schools using IPS materials will increase slightly, while ESCP will still receive low usage since only a small percentage of Indiana schools offer earth science.

Due to the appointment of a new science supervisor near the middle of FY 66, the leadership role in curriculum development, inservice education, publications, etc., was not as great as it could have been.

Work has also been carried on with a group of chemistry teachers encouragin the establishment of a state chemistry teachers' association.

In looking for an instrument to make inservice training most effective, it was decided to check out the audio-tutorial approach. A small pilot program utilizing some of Dr. S. N. Posthlethwait's botany materials was conducted in the late spring. The results indicate that this may have potential as an inservice instrument, and plans are now underway to work with a local school system to incorporate it into a Title III ESEA Project being developed by it.

Equipment, Materials and Facilities:

For the "advanced" type program the two sets of figures would drop to around 70%, 20%, and 5% for equipment and 40%, 20% and 2 or 3% for materials.

In terms of new media and its potential utilization in instruction, these figures drop drastically low. A choice of what level would truly be adequate is important in arriving at any figure. However, even if we accept those media utilizations for which today there is good evidence of their instructional merit and value in the average school, these figures might be near 20%, 15%, and 3% for equipment and 10%, 5%, 1% for materials.

In terms of the Basic or Standard programs (as outlined by the CCSSO-NSF Purchase Guide) the equipment adequacy may now be approaching the 90% point in the senior high schools, around 50% in the junior high schools, and not much above 10% in the elementary schools. The adequacy of materials would be somewhat lower, perhaps near 60%, 40%, and 5% in the respective division levels.

IOWA

Curriculum:

Course guides have been prepared in the areas of chemistry, physics, and junior high science. The 4-6 elementary science course guide is near completion.

Education:

Plans are under way to provide science consultative services via "telewriter" systems.

Consideration is also being given to the use of closed circuit TV, Educational TV, radio, and other means of communication.

The science consultant makes regular visits to teacher training institutions and works closely with professors of science and science education to improve science instruction in Iowa and prepared several project ideas in science for the ESEA Title I guideline bulletin.

The science consultant has helped coordinate a pilot cooperative college school project (CCSSP) sponsored by the National Science Foundation. The purpose of this project is to upgrade the laboratory approach to science teaching in junior high schools.

Inservice workshops in science have been held for Iowa teachers of science. Local and county seminars have been conducted at different grade levels.

Equipment, Materials and Facilities:

A few elementary schools have provided science equipment and materials to carry on an approvable science program. About 90% of the elementary classrooms are inadequately equipped for proper science instruction.

75-85% of junior high schools are lacking in basic science equipment and materials while at least 60% of the senior high schools lack equipment and materials for PSSC introductory physics. Up to 90% of the senior high schools have gross needs for improved facilities and housing to maintain living materials. This greatly limits the work in modern life sciences. Now 90% of the senior high schools appear to have adequate chemistry departments. There is a severe need for well trained instructors for all the science courses.

Evaluation:

An analysis of the educational preparation of science teachers in Iowa has been prepared using data processing techniques.

A questionnaire to determine the status of science was sent to schools of various sizes in Iowa selected at random and the results of the questionnaire were compiled and analyzed.

An analysis of course enrollments in science classes in Iowa public schools has been prepared using data processing techniques. A major evaluative study concerning science teaching has been completed by Dr. T. R. Porter of the University of Iowa, Iowa City, Iowa, in cooperation with the Iowa State Department of Public Instruction.

KANSAS

Curriculum:

Science curriculums have continued to improve as schools adopt new editions of science texts and updated laboratory materials.

The adoption of BSCS biology is still on the increase. Greater interest is noted in newer programs such as ESCP earth science, the ESI Introductory Physical Science and the various elementary science curricula.

It is our definite opinion that stronger teacher training, new Science curricula, and a better physical environment for teaching and learning, have resulted in improved instructional programs and greater learning on the part of the students. All indications from college instructors and administrators point toward a better prepared entering freshman as far as science background is concerned as compared with a decade ago. College courses are being planned to accommodate the students who come to college with not only stronger background in the basic sciences, but in many cases advanced course work in a particular area with research experience. The general level of science project work exhibited at science fairs and presented to the Kansas Junior Academy of Science is more sophisticated.

Education:

The preparation of teachers has continued to improve. New certification standards for secondary science teachers went into effect on September 1, 1965, raising the subject requirements from six semester hours to twelve in most science subjects. The field requirements remained at 24 semester hours. General education requirements for elementary teachers have increased as of July 1, 1966 from 10 semester hours of physical and biological science (must include both; may include mathematics) to 12 semester hours.

Many teachers have been able to extend their training during the past year through summer, academic year, and inservice institutes. Special emphasis has been placed on new science curricula.

Assistance was rendered to several school groups in the planning of Title III, ESEA projects associated with science and mathematics. The consultant continued to serve as a member of the Educational Trends Committee of the Kansas Academy of Science and visited the science education programs of most of the state colleges and universities during the year. He also served as special speaker for several professional groups.

The effectiveness of the State science consultant's role was reduced by the shift of the former science consultant to the position of director of Title II, ESEA in October of 1965. He continued to answer requests for science consultation on a limited basis until a replacement was hired in June of 1966. This limited service did include consulting with numerous schools on science curriculum, planning science facilities, talking to P.T.A. and civic club groups, and serving as a member of the state evaluation team for accreditation of secondary schools.

Equipment, Materials and Facilities:

The physical environment for teaching science improved this past year. A total of 316 science projects was approved in the amount of $711,613 in local and federal funds. Approximately 70% of this was for secondary science and 30% for elementary science acquisitions. Through remodeling of old laboratories, adding new laboratory furniture to old or new science facilities, and purchasing needed laboratory equipment and materials, an improved physical environment conducive to laboratory oriented science instruction has been provided in additional elementary and secondary schools of the State.

Percentage of adequacy for the

Elementary level is	30 - 50%;
for Junior High School	50 - 70%;
for Senior High School	70 - 80%.

N.D.E.A.Title III funds are still much needed as incentive to continue to improve the physical environment for science instruction. The participation has increased rather than decreased with the advent of new federal programs under ESEA.

Curriculum:

Forty-two per cent of all funds expended under NDEA, Title III were used for the improvement of science construction. Local districts are just now beginning to purchase equipment in sufficient amounts to fulfill the needs of individual and small group laboratory participation. Local matching money has been a factor and most districts first purchase essential equipment for demonstrations or one of a kind for all students to use.

Blue prints on all new and minor remodeling projects are reviewed by the Science Supervisors and a large portion of the blue prints are laid out by them. It is felt that this is an important phase in using Title III funds effectively and efficiently. The Science Supervisors work on all accreditation teams which affords an opportunity to sell a good science program at a time when it counts most to the local district, they participate in as many inservice conferences as their schedules permit.

At the present time all of our schools have been able to at least have some laboratory space and equipment available, however, the problem now is two-fold. ---------- First, there is not enough laboratory space to provide each science class with a laboratory. As a result, a large portion of the science classes, especially in the ninth and tenth grade science classes are taught in a plain classroom. Secondly, a small percentage of our high schools have adequate amounts of equipment for individual or small group participatio in the science laboratory. Consequently, this results in too much teacher demonstration or just lecture. The students who really need to work the most in a laboratory situation, the slow achievers, are usually the ones who are shunted to the plain classroom when laboratory space is not available for all the students.

Education:

Material on science and science teaching has been produced and distributed to science teachers. This has been especially stressed in developing methods of approach in the junior high school offerings of Introduction to Biological Science in the seventh grade. Earth-Space Science in the eighth grade, and an Introduction to Chemistry, Physics in the ninth grade.

Equipment, Materials and Facilities:

From 800 to 1000 well-equipped laboratories are needed to fulfill the needs of the present students enrolled in science. The total number of well-equipp laboratories is far below these figures. Not over 30% of our high schools ha adequately equipped laboratories to fulfill the needs of all the students who take science.

LOUISIANA

Curriculum:

The trends in secondary science offerings are greater because many schools are adding the PSSC programs in physics. Greater inquiry for the BSCS, CHEM study and other sciences is being considered. Much interest is indicat with reference to improving and modifying the science curriculum at the Juni High and Senior High level. Recent State adoption included BSCS, CHEMS and CBA.

A greater emphasis in science fairs and the Louisiana Junior Academy of Sciences is being maintained by the State Department personnel and professio science educators from colleges and universities throughout Louisiana.

Evidence of improved instruction from the fourteen workshops that were held in Louisiana during the 1965-66 school year indicate that substantial improvements have been made in the Louisiana science program and curriculum. A guide in conservation and resource-use education is being used in classrooms throughout the State of Louisiana.

As has been the case in years past, our greatest need in laboratory facilities is in the area of general science. Further effort will be made in the future to improve the quality of instruction in these areas.

Many schools are experimenting with ESCP at the Junior High school level. Few schools are offering the following programs: IPS, PSSC physics, BSCS biology, CHEM study Chemistry and CBA Chemistry. Many teachers have incorporated materials from these courses into their regular courses in thes various subject matter areas.

Education:

Fourteen workshops in science and conservation were held for teachers, administrators and supervisors during the 1965-66 fiscal year, with an attendance of approximately 2600 teachers. The conservation workshops are science based but in the future will be social studies based. These workshops varied in length from two days to four days. All of these were conducted during the summer months. The participants included both elementary and secondary teachers, supervisors, and administrators.

Approximately 80% of the participants were elementary school personnel which represents about 18% of this category of school personnel. The high school personnel in attendance represented about 5% of the high school teachers of the State.

75 per cent of the budget for supervisory service was used for inservice programs. It is estimated that over 5% of the teachers in the elementary school and well over 50% of the high school science teachers have received inservice training through NDEA Title III, and NSF Institutes Higher standards for teacher certification have been increased for elementary and/or secondary teacher certification and continuous evaluation of the teacher certification requirements in colleges and universities is constantly being made. The monthly newsletter of the Science section of the Department of Education, entitled "Science and Conservation Newsletter" is being continued.

Equipment, Materials and Facilities:

Title III of the National Defense Education Act has had considerable effect on providing more adequate materials for teaching science in the elementary school.

To assist with the proper and most effective utilization of equipment, equipment was on display during the science and conservation workshops which were sponsored by the Louisiana State Department of Education. The effective and proper use of certain items of equipment were demonstrated in workshops and classroom visits and will continue to be utilized for the school year 1966-67.

All secondary schools in the State are equipped with laboratory facilities. It is felt that well over 50% of these facilities are adequate. Title III has had considerable effect on laboratory facilities in the high school.

Evaluation:

The State science supervisors worked closely with the school administrators of the State by visiting schools and making recommendations for improvement in the science program, participating in parish workshops, and advising and assisting with the preparation of NDEA projects. In addition, work on the cooperative college-school science program at Louisiana State University and the Bookmens' Association to insure four pilot programs of a NSF nature in the new curriculum are underway. Follow-up and evaluation of acquisition projects during visits to the local school systems is a part of the State science supervision program.

MAINE

Curriculum:

During the past year at least 25% of the elementary school population has been provided with modern science text series. A small number of schools have been using units from modern curricula developed under the auspices of N.S.F. Both of these trends continue to date and are certain to strengthen the elementary program. 8% of the larger school systems appointed supervisors for science during 1966. Many have held the title in the past but these appointments have been different in that the individuals actually have supervisory time allotted and the responsibility and necessary authority to promote curriculum change.

There are other barometers indicating better weather ahead for science instruction in Maine. Colleges have had to strengthen their course offerings, student achievement records checked during visits show marked increases. Observations of teachers' instructional techniques indicate a greater awareness of the need for individualized approaches oriented around investigational activities.

A substantial percentage of our secondary schools are moving into individualized, inquiry-oriented programs.

Education:

There is reason to be optimistic in terms of improved science instructional methods in both secondary and elementary schools. However, since visitations, workshops conferences and curriculum work-sessions indicate an increased interest in, and acceptance of, modern science curriculum projects at both levels, certainly major factors contributing to this improved atmosphere are: (1) A younger crop of better trained science teachers gradually replacing teachers with very limited science backgrounds who have reached retirement age, (2) wider acceptance of the premise that the study of science is a particularly effective method for the development of skills basic to the learning process in many subject areas and greater recognition of the basic necessity for scientific literacy if one is to live and cope with the social and personal problems of this era.

The supervisory position provided by NDEA Title III have been particularly effective in developing an acceptance of the last two factors.

The science supervisor and instructors from the state colleges met for the first time to discuss methods of strengthening programs designed to prepare teachers for the elementary, junior high and secondary level. Specific recommendations from this meeting were forwarded to the board of college presidents for their action.

Inservice training through workshops, seminars, consultations and conferences affected 1249 elementary and secondary teachers. This was in addition to individual or small group meetings held during visitation. The science supervisor devoted well over 230 hours to formal training programs alone. Consultative services were supplied as requested.

Supervisors in the Division of Instruction have worked closely on many training sessions, providing a multi-disciplinary attack on problems common to each subject area. The Science Supervisor has coordinated his efforts with the efforts of math, reading, English, health-safety-physical education, and ETV supervisors during the fiscal year. Team work with severa supervisors is a common event in the department. In addition the Science Supervisor works closely with the director of Field Services and architects in the development and approval of laboratory designs.

Publications are numerous. These include a Science Newsletter issued three times during the academic year, contributions to an elementary school bulletin, materials for curriculum study workshops, contributions to a series of conservation units for the elementary school and reviews of enrichment on textual material.

Equipment, Materials and Facilities:

427 elementary and 366 secondary projects were carefully reviewed by the science supervisor. 90% of the secondary projects involved either the acquisition of equipment in quantities sufficient to allow individualized laboratory work or the acquisition of laboratory furnishing to equip rooms in newly constructed buildings or minor remodeling projects. 60% of elementary projects involved the acquisition of supplemental or enrichment science content reading materials, 25% involved the acquisition of equipment either in kits or in quantities sufficiently large to allow small group instruction.

During fiscal 1966 50% of Maine's secondary schools had acquired, with the aid of NDEA, adequate laboratory facilities for science instruction. Since nearly all elementary classes in Maine function in self-contained classrooms, very few have a specialized science room. A very limited number operate on a semi-departmentalized basis. These classes usually have some type of science facility available, usually inadequately equipped for individualized instruction. Improvements in the supply of elementary science equipment available made over the past few years are continuing and NDEA Title III funds are largely responsible for promoting this chang The fact that more elementary schools are ordering and using the equipment is indicative that elementary science is becoming more activity oriente

Percent of adequacy of equipment and materials provided by NDEA Title III are as follows:

Subject Area	Adequacy of Equip.	Adequacy of Materials
Physics	50%	70%
Chemistry	60%	90%
Biology	70%	50%
Earth Sc.	15%	25%
Elementary	10%	20%

MARYLAND

Curriculum:

Curriculum development has been encouraged and is evident throughout the State, particularly at the elementary and junior high school levels. New programs have been examined and curriculum materials have been developed and written for use by local school systems. Emphasis in the curriculum area has centered around two major objectives: (1) development of K-12 sequential articulated programs, and (2) laboratory activity-centered programs. Considerable concern has been given programs to provide general science background for all children.

The nature of the science equipment and materials purchased indicated increasing participation in new curriculum programs at both elementary and secondary levels. Increasing amounts of equipment were in quantities for use by students in instructional activities.

Education:

State leadership activities continue in five major areas:

- basic leadership services and communications for all local systems,
- special local pilot activities,
- State and regional activities,
- liaison with other agencies interested in science education and,
- work with NDEA and other Federal programs.

Regular meetings were held with local supervisors responsible for science education to consider common problems and new developments. Two State-wide conferences for supervisors responsible for science at the elementary and secondary levels were held during the year to develop local leadership thinking with respect to new programs and methods in science.

The Maryland Science and Mathematics Newsletter was published on a monthly basis to introduce new trends and programs and to promote the exchange of ideas among local school systems.

Greater cooperation was achieved with agencies interested in science education; the Maryland Academy of Sciences, the State colleges, the University of Maryland Science Teaching Center, and the Chesapeake and Potomac Telephone Company.

Equipment, Materials and Facilities:

All 24 local school systems in Maryland participated to some degree in the Title III NDEA science acquisition program. This involvement extended from a low of 9.6% to a high of 90.1% with a median of approximately 34% for science with respect to total NDEA III expenditures.

Over 62% of the expenditures for science were for science equipment and materials specifically for classrooms and laboratories; another 22.5% was for audiovisual equipment; with the remaining 15.5% in audiovisual materials, devices for producing instructional materials, consumable materials used by the teacher in the preparation of instructional materials, books, and other printed materials.

Acquisition of audiovisual equipment also indicates the greater availability of this equipment for use by science teachers; and thus, the more frequent use of audiovisual materials in the instructional program.

In the fiscal year 1966, the area of Elementary Science was felt to be adequate in providing daily practice experience; Secondary Science was 60% adequate in this respect. The most prime factor in bringing about an increase in the above percentages is teacher training and outlook in terms of the philosophy and objectives of modern science teaching and the subject matter of modern science.

Evaluation:

Visits to classrooms and discussions with teachers indicate an increasing involvement of students in science activities and laboratory programs at both the elementary and secondary levels.

MASSACHUSETTS

Curriculum:

A strong trend is noted in the acquisition of elementary science equipment. Increasing numbers of elementary teachers are making use of the new materials and media for this grade level.

State Science Supervisors served as coordinators and evaluators of the Junior Science and Humanities Symposium co-sponsored by the U.S. Department of the Army and Worcester Polytechnic Institute. The science staff has served as members of the State and Regional Science Fair Committees. The planning and judging sessions require active participation by professionals in order to make these events worthwhile for able student participation.

Education:

Along with a strong trend in the acquisition of elementary science equipment is a similar trend in a demand for inservice education for teachers in order to keep abreast of these new innovations in science education. An estimate of the adequacy of teacher preparation to meet current needs would be 10% at the elementary level and 75% at the secondary level.

Equipment, Materials and Facilities:

Direct participation in the planning of school laboratories and classroom facilities as well as the acquisition of classroom equipment by the science supervisors is evidenced by processing 456 science project applications. A major activity was the new requirement for the submission, review and approval of long range plans for curriculum development as a prerequisite for Title III project approval. This has resulted in a more adequate acquisition program which included 1/3 of all projects submitted under Title III NDEA.

Adequacy of the science equipment, materials and media currently provided at the elementary level is twenty per cent; at the secondary level it is fifty per cent.

MICHIGAN

Education:

As conversion to a "doing" approach to science occurred, with equipment purchased through NDEA Title III, this in turn has lead to increased workshops and inservice education activities for science teachers conducted at local, regional and state levels.

Approximately thirty schools have been visited because of invitations for consultative assistance in this past year. The science consultant has also worked with several groups of science teachers and administrators. When resources are limited, working with groups is far more effective than working on an individual school basis.

Equipment, Materials and Facilities:

Science continues to be the major area of interest and concern of the local school districts of Michigan. Of the 476 school districts receiving federal funds via NDEA Title III, 472 districts submitted science projects. Twenty-three per cent of all projects and 63 per cent of the NDEA Title III "dollars" were requested for the improvement of science.

The meaning of added science equipment, in terms of NDEA, Title III, has triggered the conversion from learning about science to doing science. This is especially true at the elementary and junior high levels. It has also given schools the opportunity to expand the science curricula, especially at the secondary level.

With the growth in school-age population occurring at the same time that science is being converted to an active, experimental, inquiring experience, the answer to the increased need for science equipment seems obvious.

MINNESOTA

Curriculum:

NDEA funds were used in developing an alert, aware, and knowledgeable' corpsof educators ready and understandingly able to see the gifted child as a student and willing to initiate such action and bring about such changes in the curriculum that would assure an adequate school response to his individual needs.

There is a significant change in the quantity and quality of utilization of instructional materials in science.

Education:

Twelve conferences for school administrators and audio-visual education personnel were held this past school year. There were 269 persons in attendance at these six-hour conferences. A considerable number of superintendents and principals said that "this is the kind of information we would like our teachers to have". There is some evidence that as a result of those conferences, more emphasis is being placed on utilization of instructional materials. Teachers are being asked to go back to school and take courses in Audio-Visual Education Methods. A series of regional inservice workshops is being planned which will include printed guidelines on teaching techniques with audio-visual instructional materials.

Equipment, Materials and Facilities:

Adequacy of the equipment and materials provided by NDEA Title III is 60%. I am sure this will improve as more teachers become better trained in the use of the materials.

MISSISSIPPI

Curriculum:

Emphasis has been given to adequate plans for improvement of instruction as a condition for approval of projects. This has brought about many opportunities to encourage improvement of curriculum and facilities through the Title III NDEA program.

There have been more individual laboratory experiences at both elementary and secondary level. New units have been added to courses, and there is an increased amount of project work and course enrichment through reference materials. New equipment and materials have made experimental science possible. A number of schools have adopted the lab oriented programs, have set up CHem Study programs and PSSC physics. Two of the teacher training institutions of the State have, within the last year, offered training courses in CHem Study for the teachers and one or more in BSCS and PSSC physics. Many teachers are using overhead projectors and transparency materials for science.

Education:

Title III NDEA, has centered attention on the improvement of instruction. The Curriculum Guide for Junior High School Science has been completed through a series of summer workshops and is being printed. Work with a number of State and national agencies has provided special programs such as the NASA Spacemobile Program and the NSF High School Visitation program of Science.

Work with the Mississippi Forestry Association and associated agencies has resulted in a Teachers Conservation Workshop.

Many suggestions for program improvement have gone out to teachers through the publication "Science and Math Newsletter". Consultation with the Teacher Certification Council within the last year and had a proposal accepted to certify earth science teachers.

Equipment, Materials and Facilities:

The State does not have more than 60 per cent of the equipment and materials needed for a basic science program. Only a small per cent of schools at the high school level have all the needed equipment. There is a great need for basic experimental equipment such as electrical meters and shelving units. Data from 74 questionnaires completed by the same number of schools which involved 22,746 students in the summer of 1966 revealed that schools participating in Title III NDEA were better equipped than non-participating schools.

Evaluation:

Local school personnel have reported improved ACT scores for individual schools. Statistical data will show that within the last three years the number of high school graduates has increased by more than 15 per cent, and the number of graduates going on to college has increased by 8 per cent. It is believed that this is due largely to new and improved school facilities, including equipped science laboratories and material for instruction in science. Coincident to the acquisition of materials and equipment has come an increase in teacher attendance of workshops and institutes.

Curriculum:

During fiscal 1966, science curriculum development and changes in teacher certification standards have been accomplished by the Missouri State Department of Education. New science curriculum guides have been developed by a statewide curriculum committee under the supervision of the Director of Curriculum with major assistance from the NDEA, Title III science consultants. Included are the areas of life science, earth science, and physical science in grades 7, 8, and 9; also, general biology, advanced biology, chemistry, and physics for grades 10, 11, and 12. These guides will be available for distribution late in 1966. In the area of junior high science, there is a continued trend away from general science in grades 7, 8, and 9, with increased emphasis on a specialized, sequential approach including life, earth, and physical science.

Education:

Through participation in NSF Institutes, college extension and summer programs and our NDEA, Title III inservice program, teachers in Missouri are continually updating their science background. During the 1965-66 school year, eleven science workshops, two hours per week for 8-10 consecutive weeks involving 360 elementary teachers, were conducted by the NDEA, Title III office with the consultants serving as instructors. Also, approximately 20 one-day science workshops and conferences were carried on throughout the State with an estimated 400 elementary and secondary teachers, as well as administrators, involved. Direct classroom observations by the science consultants, as well as opinionnaires filled out by the participating teachers, indicate that the workshops conducted through NDEA, Title III have been quite effective in acquainting teachers with contemporary methods and trends in science education. During the summer of 1966, the University of Missouri at Columbia, University of Missouri at Columbia, University of Missouri at Rolla, St. Louis University at St. Louis, and William Jewell College at Liberty conducted a program for the upgrading of 110 physics teachers.

NDEA, Title III has effected teacher certification standards which have been raised to keep pace with the increasing demand for more and better instruction. Elementary requirements increased from 8 to 12 semester hours, the junior high requirement increased six hours and now mandate five semester hours of work in Earth Science while the requirement for teaching biology chemistry and physics increased six hours from a 24 to a 30 semester hour requirement in each of these discipline.

Equipment, Materials and Facilities:

During the past year schools continued to procure science equipment and materials through NDEA, Title III which is helping to provide for more individualized science instruction. Much more is needed in Missouri's schools to provide all students with the opportunity to be directly involved in meaningful scientific investigations.

90 percent of the secondary schools in Missouri have some laboratory facilities, however, not more than 30 per cent of these are equipped to teach all science courses with a laboratory approach. Most elementary schools have at least a few items of science equipment, but less than 5 per cent have adequate facilities for teaching a student-centered science program. NDEA, Title III in the past has helped considerably in the secondary sciences and is filling some of the needs in the elementary and junior high schools. Also, since the inclusion of the laboratory schools and the public junior colleges under NDEA, Title III in Missouri, extensive improvements have been made in their science programs. This improvement has come about as a direct result of better science equipment and facilities made possible through NDEA, Title III. With the increased emphasis on a laboratory oriented, student-centered K-14 science program, the need for laboratory facilities, equipment, and materials is increasing at all levels. Added expenditures will be necessary if we are to keep pace with the modern trends in science education.

Evaluation:

Data derived from general placement tests given to freshmen entering the University of Missouri at Columbia indicate a definite increase in the achievement of high school students this year as compared to the previous year. This general test information reflects the beneficial effects of NDEA, Title III on the total educational program.

MONTANA

Curriculum:

In a study of about one-third of about a hundred and seventy high schools data showed increasing numbers of biology teachers adopting the BSCS curriculum material. Although fewer in number, teachers of chemistry are also beginning to use CHEMS material.

Education:

In cooperation with the State Science Supervisor, the University of Montana has an NSF grant for a series of 15 inservice training programs for elementary science teachers which will provide opportunities for approximately 500 in fiscal 1967.

In addition through the use of our mobile Math-Science trailer, the Science supervisor participated in a number of individual school and pre-school rural workshops at which the science curriculum and instructional methods were discussed and constructively evaluated.

One-day Saturday workshops were conducted in some 13 rural locations. Approximately 130 teachers attended 13 one-day workshops that were laboratory centers. It has been noted that NDEA projects were submitted for science equipment as a direct result of these workshops.

The exceptionally large attendance at the National Science Teachers Association Regional meeting in Great Falls last October was indicative of much increased interest in science teaching in grades 1 through 12. I would estimate that 850 teachers were present at this meeting. There was also an increase in attendance at the BSCS State meeting in Bozeman in January of 1966 and a physics meeting sponsored by Montana State University in the Fall of 1965.

Equipment, Materials and Facilities:

It is estimated that under NDEA III program approximately one-half of the elementary schools in the State have acquired equipment sufficient to provide students with daily practice in science experiences. Secondary schools have achieved an estimated 75 per cent of their equipment needs under the NDEA Title III program.

Inspection of our NDEA Title III projects for fiscal year 1967 indicates more very small elementary schools are acquiring basic science equipment such as pulleys, balances, microscopes, and alcohol burners. The projects also contain more sophisticated equipment such as spectrometers and autoclaves at the secondary level which would indicate improvement in the laboratory instruction at the secondary level.

2

Evaluation:

School visits, attendance at professional meetings, and analysis of NDEA Title III project applications all indicate that science instruction in the public schools of Montana has improved during fiscal year 1966.

Curriculum:

Science education courses, especially those for elementary instructors, have been influenced significantly, with positive results. More educators are involved in improving science education K-12.

K-12 science curriculum committees have been established in more schools to develop and implement K-12 science programs.

Education:

Teacher preparation and methodology have been the points of focus for the bulk of the supervisory and related services. Approximately 300 elementary instructors were given inservice training.

NEVADA

Curriculum:

A check-list survey revealed that both administrators and teachers felt that significant progress had been made in the areas of teacher preparation, with a concommitant advance in classroom effectiveness, and more extensive use of equipment obtained with the aid of NDEA Title III monies. At the secondary level, the laboratory was more profoundly affected than was the classroom.

Accepting the philosophy that long-range curriculum planning makes for more effective use of teacher personnel and Title III funds, the consultant has met extensively with teachers and administrators in pre-project planning.

There has been a significant tendency to pursue meaningful long-range programs rather than stop-gap devices. A by-product of this emphasis has been the development of a State Curriculum Guide for Secondary Science. Particular interest has been apparent in the improvement of education for conservation on a State-wide basis.

Education:

Great leadership potential, particularly among the secondary school science teachers in extending help and informal inservice training to less specialized elementary teachers has multiplied the impact of the NDEA, Title III program.

Equipment, Materials and Facilities:

The elementary programs with 25 projects utilized 12% of the science funds with 28 projects. Even with these expenditures the adequacy of materials and equipment is, as yet, below the level of what it should be. The elementary science level approximates 22% of what is minimal to be adequate. The secondary science program is at a level of approximately 38% of adequacy in equipment and materials.

Curriculum:

Through the NDEA supported position of Consultant, Science Education a variety of activities have been promoted, organized and/or supported which have definitely strengthened and improved the teaching of SCIENCE in New Hampshire.

Continuing close cooperation with the State's ETV, WENH-TV, culminated in (1) a major breakthrough, support through ESEA, III and the Hampton, New Hampshire Supervisory Union, an elementary school teachers inservice program in science to be presented the 2nd half of the 1966-67 school year and (2) the selection of the KTCA Twin-City Educational Television program, "Earth and Space Science" for grades 8 or 9 use during school year 1966-67.

Education:

Worked with the chairman of the Department of Geology at UNH, the University of New Hampshire to set up an established program leading to a major as an earth science teacher. This program was accepted by the University committee on program approvals.

Spark-plugged the formation of the New Hampshire Science Teachers Association (NHSTA) which has commenced an effective operation as a state-wide group and has focused on six regional organizations as the keys to professional assemblage promising changed behaviors for better science teaching; planned and participated in 43 inservice teacher workshops and programs in science teacher education.

NEW JERSEY

Curriculum:

There is considerable evidence that science teaching has improved since the inception of the NDEA III in 1959. Some of the most important efforts of the Title III program include: (1) increase in the amount of science laboratory equipment acquired to make possible more individual and small group activities, (2) an increase in the availability of laboratory facilities to students not enrolled in college preparatory courses, and (3) more time devoted to laboratory activities and investigations.

Our application reviewers report that: schools are acquiring equipment and materials for student use in the laboratory or field. Every high school in New Jersey offers Biology, Chemistry and Physics as part of its educational program with a strong emphasis on laboratory work.

Education:

Elementary workshops dealing with the use of equipment and techniques of utilizing equipment were conducted in the State. The annual Christmas Science Workshop for secondary teachers was held dealing with understandi and using equipment for chemistry, biology and physics. Teachers actuall constructed their own equipment such as power supplies, colorimeters, electric motors, animal traps, etc. To promote more effective use of science materials, various eligible items were demonstrated and discussed in various inservice workshops held throughout the State.

More than twenty schools received consultant service and/or were visited in connection with the planning of facilities, equipment and programs related to NDEA science projects. It is estimated that about 25% of the secondary school science teachers in New Jersey participated in conferenc inservice programs sponsored by the Office of Secondary Education.

An important element in the consultant's activity during 1965-66 involved a close working relationship with Titles I and III of ESEA. This close working relationship served as a vehicle for establishing and maintaining a cooperative involvement with local school teachers, university and college professors, industrial researchers and lay people concerned with good education.

Evaluation:

In general, districts have matured in their understanding of the purposes and opportunities of the NDEA and have established better procedures for developing projects.

The science consultant, in his visits to schools, observed the use of science facilities, equipment and materials, in order to determine whether or not new equipment and materials were appropriate and were being used effectively.

Curriculum:

In the evaluations teachers and administrators were interviewed concerning their use of Title III, the equipment purchased thereby, and its effectiveness in their instructional program. In all of the schools visited it was indicated that the NDEA, Title III program had been of assistance.

At the secondary level several of the schools indicated that their program would be in dire need if it were not for the Title III program. Much of their equipment had been purchased through the matching fund program and school administrators indicated that the program offered not only matching funds but also the incentive to themselves and their teachers to provide more and better equipment, and as a result, a better instructional program.

Education:

The Science Specialist conducted six in-service workshops with 135 teachers attending. They were primarily for elementary teachers and their content basically covered techniques of teaching and involving students in "doing" science.

A publication, "Science Spectrum," was initiated as a newsletter to all high school and junior high school teachers of science, and to all principals of elementary, junior and senior high schools. It serves as an organ of communication between State and local levels, provides a means of sharing workable ideas, and passes on news of this particular phase of education. The "Science Spectrum" is published four times each academic year.

In a special meeting of the Recommendations Committee of the New Mexico Science Teachers Association, a set of recommendations for science facilities was drawn up to be reviewed and discussed by the membership. This list will eventually be presented to the Architects Association and to school administrators as minimum standards for laboratory and classroom facilities.

Equipment, Materials and Facilities:

Based on the evaluations made in the field and the program reviews that schools submitted after self-evaluations, it appears that the materials purchased for use in science instruction under NDEA, Title III, are 80 to 85 per cent adequate. Many more laboratory situations are in evidence now than ever before in the State. Laboratories are being equipped through NDEA funds, and more students are experiencing science since equipment is available.

Curriculum:

Effort has been directed toward the proper place of the laboratory approach in all science courses for grades K-12. Work for grades K-6 has stressed proper utilization of present courses of study. For grades 7-9 the Department has continued to prepare syllabuses--handbooks for various blocks of the science 7-9 program for use in any order deemed appropriate locally. In grades 9-12 experimentation has continued which will lead to revised courses of study for general use at the projected times, as follows: physics (September 1967), chemistry (September 1967), biology September 1968), earth science (September 1970?).

There has been a definite updating of teachers and of content. It is continually obvious that the change is a result of a variety of factors, including NDEA funds, NSF and similar institutes, NSF and State academic year institutes, NSF, State and local curriculum groups, inservice training, preservice training, revised certification requirements, equipment, updated textbooks, films, and television.

Over twenty-five thousand students were given lessons by Museum Instructors. Not only do these classes serve as supplementary instruction for students, but they are also designed as working demonstrations of substance and method for the classroom teacher.

Education:

The increased emphasis of laboratory use in science courses and the revision of science syllabuses have created a need for a massive inservice program for teachers. This unit has initiated various programs or has cooperated with other units in providing these services. One or two-day workshops were organized by the staff. Each program was different but unusually consisted of discussion of the proposed syllabus, explanations of "modern" and/or difficult areas, appropriate laboratory exercises and audiovisual materials. The estimated numbers of teachers present were biology (800), chemistry (700), physics (700), and earth science (400). Inservice programs included Astronomy, Geology, computer-assisted instruction, and aerial fieldtrips, subsidized largely with State and other Federal funds, include science workshops, locally originated projects (LOIS), and regional programs in science.

The Museum Education Office with the co-operation of the members of the curatorial and Science Service staffs, conducted workshops for teachers on scientific subjects which were to give the teachers added information and experience to be used in their own teaching. Nine workshops were planned although three had to be cancelled because of bad weather. One hundred and fifty-six teachers attended - forty-nine were turned away due to lack of space in which to assemble them. Among the workshops held were two aerial field trips over the Adirondack mountains in a light plane with a lecturer (a geologist of the Science Service staff) accompanying each of the sixteen flights.

The Museum's loan program was continued and expanded to fill a total of six hundred and twenty-eight requests from teachers. These loan kits, which include displays of Indian artifacts, Iroquois masks, rocks and minerals, fossils, mammal skulls, mammal skins, bird skins and insects are designed as instructional aids for the teacher in classroom demonstration.

Higher standards of teacher certification were mandated effective 1 September 1963 and 1 September 1966. Certification for elementary school teachers requires some courses in science for all prospective teachers plus a major in some area which may be science.

Eight issues of the newsletter "Museum Education" were distributed statewide to a mailing list of over two thousand teachers. These newsletters provided information concerning museum lessons (to school classes), workshops, loan kits, new exhibits and museum publications. Four of the issues contained articles on pertinent conservation problems including the pollution of State waters and the need for immediate anti-pollution action.

Publications developed through NDEA, Title III Supervisory and Related services include the following:

> Science 7,8,9 -- Experimental Syllabus -- Block E -- Our Planet Earth. Distributed September 1965.
>
> Science 7,8,9 -- Experimental Syllabus -- Block G -- Living in the Space Age; Block H -- Weather and Climate; Block I -- Forces at Work; Block L -- Living with the Atom. Being printed or ready for printing.
> 1965 editions of Biology -- An Experimental Syllabus, Chemistry -- An Experimental Syllabus, and Physics -- An Experimental Syllabus.
> These publications were used by 90-100 experimental schools in each area and were sent to all secondary schools for information.

Equipment, Materials and Facilities:

Analysis of project proposals indicates the following trends:

a. Increases in expenditures for elementary science equipment often following the appointment of coordinators of elementary science or elementary curriculum.

b. Increases in expenditures for remodeling or equipment to allow additional laboratory work in the junior high school science courses.

c. Increases in expenditures for more sophisticated equipment for "modern" or advanced placement science courses.

Estimates for grades K-4 are particularly difficult because, while there is general agreement on the need for pupil activities, there is no agreement in the field on the need for specific laboratory facilities. NDEA funds have been used in the elementary schools to obtain portable laboratory tables. These tables are used largely in grades 5 and 6. Few elementary schools have acquired fixed facilities.

About 10-15 years ago most high school buildings had junior and senior high school classes in one building. Laboratory facilities were available for grades 10-12 and only rarely for grade 9. Most of the new schools in urban and suburban areas provide separate buildings for senior and junior high school classes with some laboratory facilities being built for grades 7-9. Increasing numbers of schools now offer earth science and biology, which are laboratory courses, in grades 7-9. The low estimate of percentage of adequacy in grade 9 is related to improper facilities for the advanced courses at this grade level. NDEA funds were formerly used largely to add demonstration tables to ordinary classrooms in the junior high schools. Recently the funds have been used largely to provide better facilities for pupils in advanced classes in the senior high schools. The largest unmet need continues to be the inservice training of teachers at all levels of grades K-12. Since the modest effort by NSF in subsidizing institutes for elementary school teachers is apparently going to be discontinued, the need for training in this area will become increasingly important.

The estimates of the percentages of public, elementary and secondary schools equipped with laboratory facilities and the estimates of the adequacy of these facilities for all pupils studying science are:

GRADE LEVEL	PERCENTAGE EQUIPPED	PERCENTAGE ADEQUATE OF THOSE EQUIPPED
K-4	10%	50%
5-6	40%	50%
7-8	70%	70%
9 (General Science)	85%	50%
9-11 (Biology-Earth Science)	80%	60%
10-12 (Chemistry-Physics)	95%	80%

Evaluation:

The most complete research report on evaluation was prepared by the Bureau of Department Programs Evaluation. The report printed in August 1965 is entitled National Defense Education Act -- Title III - An Evaluation of the Program in New York State. Enrollment statistics in the secondary school sciences may be found in Papers Written in Regents Sciences 1940-65 New York State (January and June). These statistics tend to show steady or increasing percentages of enrollments in all sciences.

Curriculum:

There has been a noticeable improvement in the quality of science fair projects entered in the District and State science fairs. Four students from the State received awards at the Science Fair International. Six students presented research papers at regional science symposia at Princeton, New Jersey. Five students from the State presented scientific papers at a Regional Youth Science Congress sponsored by the National Aeronautics and Space Administration at Langley Research Center, Hampton, Virginia.

Physical science for the ninth grade was televised live for 30 minutes per day, five days per week, from September through May. This program was broadcast through the facilities of the State-owned Educational Television stations to approximately 6,000 students in 119 classes of the 85 participating schools. Instructors' guides were prepared by the studio teacher and issued by the State Department of Public Instruction to all classroom teachers participating in the ninth grade television physical science programs. The classroom teachers attended workshops with the studio teacher. Appropriate consultants assisted in the workshops for the television science teachers. The science supervisor cooperated in this program by working with the studio teacher and an advisory committee in formulating the topics to be included in the course and the sequence of their presentation.

Education:

Science supervisors have collaborated with colleges and university departments by participating in workshops and seminars for science teachers and prospective science teachers, by speaking to science clubs and by working on problems of mutual interest and concern pertaining to curriculum and course content. They served as consultants in NSF institutes for elementary and secondary science teachers and assisted in planning and organizing in-service institutes for chemistry and earth science teachers.

Work was done in working with superintendents, school principals and local science supervisors in planning science programs, setting up in-service programs, remodeling science laboratory facilities, and the acquisition of equipment and materials to carry out the program of instruction.

The science supervisors conducted approximately 45 workshops, conferences and in-service programs. The purpose of these programs was to demonstrate the effective use of equipment and materials acquired under the provisions of Title III, to bring teachers up to date on curriculum developments, and to plan effectively for the construction of science laboratory facilities. These conferences and in-service programs were generally scheduled for 1 1/2 to 3 hours in the afternoon and/or evening.

An advisory committee recommended the topics to be presented in the "Methods for Modern Teachers" in-service television series. The topics recommended were judged to be of deepest concern to the greatest number of science teachers in the State.

In addition to the programs which were conducted within school administrative units, the science supervisors produced seven in-service television programs for high school and junior high school teachers. Five of these programs were presented for the purpose of introducing changes in the junior high school science curriculum and improving science instruction by the use of problem-solving and laboratory investigations in the seventh grade life science course and the ninth grade physical science course.

North Carolina is in a transitional period in the certification of teachers. Under the new certification program, elementary teachers will be required to have some knowledge of biological and physical science. Secondary science teachers certified under the new certification requirements will be required to have a broad foundation in science and mathematics with concentration in one area of science. Study in the specialized area of science may be in biology, chemistry, physics, or earth sciences and will constitute about 1/5 of the undergraduate program of studies. In the past it was possible for an elementary teacher to be certified without any college credits in science, and secondary school science teachers could be certified with a minimum of 30 semester hours in science.

The science supervisors cooperated with the Division of Professional Services of the Department of Public Instruction in the evaluation of college programs of instruction relating to the certification of teachers. These evaluations were made on the basis of guidelines to be followed by teacher training institutions in the "approved program" approach to teacher certification. One of the outcomes of this system of teacher certification has been the strengthening of the preservice education programs for prospective teachers.

The science supervisors prepared a Science Newsletter and distributed it to all the school administrative units in the State.

Equipment, Materials and Facilities:

Facilities and equipment for teaching science have been improved in many of our schools. During the year the science supervisors rendered assistance to local school administrative units in projects involving the acquisition of science furniture and remodeling of science laboratories. This assistance involved working with superintendents and their architects in 27 school administrative units. Assistance was also rendered in planning the remodeling of 11 science laboratories involving 7 schools. Ten per cent or less of the elementary schools in our State have equipment and materials in sufficient quantity and variety to provide the students with opportunities to experience the learning of science through discovery and laboratory type activities.

One hundred per cent of our secondary schools have some kind of science facilities and equipment. 40 per cent of the secondary schools have equipment and materials in sufficient quantity and variety to meet the needs of all students.

Evaluation:

Dr. Paul Welliver was engaged in a study of the effectiveness of in-school television instruction of ninth grade physical science. This study was conducted in connection with his work as television science instructor at WUNC-TV, Greensboro, North Carolina, and was the basis for his doctoral dissertation entitled "The Effect of Television Instruction on the Attainment of the Objectives of a New State-Adopted Ninth Grade Physical Science Course During Its Introductory Year."

John M. Goode, Consultant in Science Education with the State Department of Public Instruction, collaborated with Dr. Norman Anderson, Professor of Science Education at North Carolina State University, in making a study of the "Status of Physics Teaching in North Carolina."

Curriculum:

The effectiveness of NDEA, Title III program may be indicated by the extent of participation throughout the State, and the changes that have been effected. 365 12-year program public and non-public schools are in operation in the State. 350 actively participate in the N.D.E.A. Title III program.

We are certainly not going to admit that the NDEA funds were responsible for the total growth of our educational balance here in the school. Certainly we feel that we have stronger teachers than we had in the past as an average, that more effort has been made in the total materials that have been placed in the school. There is better organization in allowing more time to be devoted to the teaching of the basic skills which certainly would help and all of these factors go to make up a better educational program."

Laboratory work by students in the grades 1-6 is making slow progress. A number of years back we would have been happy to just have science taught in all grades 1-6 and some teacher demonstrations. Today all schools have science grades 1-6 and most all have some teacher demonstation but the goal today is to have the students do most of the experimenting.

There is a significant lag in the development of laboratories for the elementary schools. Recently constructed elementary and middle schools and plants now in the planning stage, include more adequate facilities for science. There is a trend towards obtaining the services of specialists on the elementary level, This should increase pressure at the local level for better science facilities, equipment, and instruction. The request for funds greatly exceeds the amount of money available. Some schools are limited in their participation due to the lack of matching funds on the local level.

Education:

Inservice programs are locally or regionally based and utilize the instructing personnel of that area. We rely heavily on people who have attended federally supported summer institutes. A leadership conference with these instructors is held for the purpose of planning programs and materials. Meetings are scheduled before the inservice program for the purpose of planning, and they are also held after the program for the purpose of evaluation.

Equipment, Materials and Facilities:

NDEA, Title III must be credited with providing assistance in upgrading, expanding, and improving courses through the medium of equipment and materials acquisition programs. In the fields of science, the adequacy of the laboratory facilities has increased dramatically. This is confirmed by visitations made by the State Science Supervisor. Reports we have from the schools state that:

> "Enrollment in chemistry classes increased by 20%"
>
> "New laboratory facilities and additional equipment have been put to use during the past three or four years. An entire new outlook and attitude has been instilled in the student body."

Equipment and materials for science courses has made steady progress but we have still not reached our goal to have enough equipment for students to work in groups of two. Chemistry is probably in the best position followed by biology and physics. The physical science course for ninth grade uses the chemistry and physics equipment. About 75% of the schools of the State have excellent facilities for chemistry and physics. The biology laboratories have improved as much but our standards for biology have been elevated and many biology laboratories lack enough room for live plants and animals and do not have enough sinks, water sources, electricity outlets and gas jets. Perhaps only 40-50% of the schools would have laboratories fitting these new standards. 10-20% of the schools have adequate facilities for seventh and eighth grade science. Equipment and material is also lacking in most schools.

Evaluation:

To learn if any discernible improvement in learning has resulted from NDEA, Title III can be determined from the test score of the tests which have been administered under Title Va. A contract with the Bureau of Research of the University of North Dakota was negotiated. The results of this study indicate in the language of educational researchers, "significant improvement."

A superintendent attesting to the effectiveness of NDEA, Title III indicated the following:

> "Certainly we are not willing to admit that the NDEA funds are responsible for all the growth which is quite apparent in the results of our two Iowa tests of Educational Development which were administered to the same people in a period of two years. In our comparative study it would indicate that the ninth graders in 1963 which were the 11th graders in 1965 had a growth of Social Studies from 47th percentile to the 67th percentile: In background Natural Science from 61st percentile to the 74th percentile.

Curriculum:

College science staff members seem to be more in agreement that students arriving at their institutions are better prepared. Many have stated that their 1st year offerings have been revised and up-dated. One Bowling Green University Professor, Dr. Gerald Acker, Director of Junior Ohio Academy of Science states that the caliber of the projects submitted for Science Fairs was much higher than in previous years. Also, the scientific papers prepared and presented by the participating students were definitely on a higher level.

There is considerable more interest being expressed in the improvement ofthe elementary science programs. Some team teaching programs were initiated and laboratory experiences for elementary students are increasing.

More inquiries are being received in regard to the offerings for the junior high school science programs. More thought is being given to the improvement of the inadequate facilities for science teaching at the junior hign school level. There appears to be a trend toward facilities that will promote more individualized student participation.

Science projects submitted tend to show an increased emphasis on the purchase of multiple pieces of laboratory equipment for student use rather than single pieces for demonstration purposes. There is considerable evidence that there is some attempt being made by more schools to secure enrichment materials; reference materials; and something more than just the necessities.

School districts have reported that now their students were able to enroll in a laboratory science which had in the past been taught as a lecture course.

More interest is being shown by teachers in up-dated curriculum materials. This interest is not just in adoption of the new courses but adaption of portions of these new courses so as to fit in their present courses.

Education:

During the year 25 inservice workshops were arranged and supported financially by this office. Most of these consisted of twenty hours of classroom instruction.

Equipment, Materials and Facilities:

At the elementary level about ½ of the schools would have some science laboratory facilities. Of these schools about 5 per cent could be considered adequate. In many instances a portable demonstration table is the facility.

There is still a great need for types of equipment for individual student use at both the elementary and secondary school levels. The greatest need for this type of material would be at the junior high school and elementary school levels.

It is estimated that all of the high schools in the state have science laboratory facilities. Probably a little more than 90 per cent of these would be considered adequate for their particular needs.

School officials indicate that the acquisition of new and modernized equipment would not have been possible without the help of Title III. One district of better than average means stated that their science programs had been moved forward from 2 to 3 years with the assistance of this Title.

Curriculum:

Science teaching has been improved greatly by Title III, NDEA. More students are taking science and more science courses are offered. The content inservice classes has been improved and teacher preparation is also improved. Elementary science has been changing from a reading class to experimentation class. New methods of teaching have also improved.

Education:

Our curriculum commission has a committee now working on a guide for elementary science, grades 1-6. This committee has met several times during the school year 1965-66, and the publication is being edited at the present time.

Twelve per cent of elementary and 20% of secondary teachers have participated in inservice training in science improvement. This percentage is difficult to maintain because of teacher tenure and replacement by beginning teachers. Ten per cent (10%) of our Title III budget for supervisory services has been used for inservice training in science.

Many of our larger schools have inservice training programs of their own. We need more work in the area of elementary science as well as earth and physical science; 75% of our secondary schools are equipped for teaching modern science, but with new elementary programs such as AAAS, we will need to stress the purchase of new materials.

The purchase of equipment is becoming more specialized to fit requirements for new science disciplines (BSCS, CHEMS etc. More visual aids are being used. Our Director of Educational Media is available to work with individual schools or in workshops in the proper use of these materials.

Through Title III we have been able to equip our school laboratories in science. Not only have we been able to equip our laboratories; but we have created an awareness of the need for better science teaching. Our administrators have become aware of this need and place science high on their priority list. Thus the teaching of science has been strengthened. Many small schools who taught only general science and biology now alternate chemistry and physics while many are offering biology, physical or earth science to students in junior high school, thus making it possible for better students to take science Seminar or more advanced classes.

Facilities are available for teaching science in 90% of our schools. We also find a few districts still need more facilities for teaching science.

Curriculum:

Of 218 high schools in the state the following table shows a comparison of the number of high schools offering new courses during the last two years.

	1965-66	1964-65
BSCS	188	63
CBA-CHEMS	101	51
PSSC	75	49
Earth and/or Space Science	40	28

The marked growth in these course offerings indicates that many schools are examining their science programs in an attempt to improve and update the science curriculum.

Education:

Supervisory services from the State Department of Education have been in constant demand for several years. As previously indicated, the consultant on science participated in 31 workshops and reached approximately 1,800 teachers during the past year. Repeated requests indicate the value of these services. In seven school districts the consultant on science met with local curriculum committees to assist them to reorganize and update their kindergarten through 12 science curricula. All districts are continually encouraged to reorganize their science curricula in view of the developments in recent years.

Quality of science instruction is improving when we examine the initiative and leadership at the local district level to bring about change in science programs. During the past year thirty-one inservice workshops in science were held at the request of school administrators. These were designed to explore the changes occurring in science teaching.

Equipment, Materials and Facilities:

The percentage of adequacy of equipment and materials which will provide all students with laboratory experiences, is about 30 per cent for the elementary schools and about 60 per cent for the secondary schools.

As in previous years, the state allotment of NDEA Title III funds was completely used for equipment, instructional materials, and minor remodeling. In addition, all plans for science facilities in new construction contain laboratory facilities for science instruction. It is clear that local programs are continuing to implement more activities and investigations in their instructional programs and have accepted science teaching as a laboratory-centered program.

Curriculum:

The Science in Action continuum (K-12) is on laboratory-centered or discovery activities which can be used in ungraded instruction and thereby provided for individual differences in ability. Student participation is the mainstay of the program which coincides in philosophy and activities with national science curriculum developments. The booklets are devoted to a particular topic and include suggested activities that teachers can use to introduce a laboratory-centered program into their existing science program.

Forty-eight thousand copies of the Science in Action Program K-9 were provided to the schools and teacher preparing colleges in Pennsylvania. This program is similar to the nationally developed elementary programs and embodies the State recommended science program. Many teacher's colleges are using Science in Action as part of the prospective teacher's training to teach science and in this way the colleges provide support to the State program.

Science education, aided through the NDEA, Title III Program appears to be moving in the following directions:

a. Away from teacher lecture and demonstration - toward pupil experimentation and participation.

b. Toward treatment of science data in quantitative terms instead of descriptive summaries of known facts.

c. Toward an articulated K-12 Science programs; formulated locally and without dependence on a textbook series as a course study outline.

d. Toward use of the child's environment indoors and outdoors, as a laboratory instead of seeking the answers in the teacher's behavior.

e. Toward laboratory experiences for all science students including those who are non-college bound.

f. Toward organization of science content around basic themes and overlapping of subject or discipline areas.

g. Toward greater use of community resources, i.e.: ETV, museums, team teaching, flexible scheduling, etc.

Education:

Conferences, consulting activities, meetings with county and district administrators, and teacher workshops were conducted to help in the upgrading of science curricula. Professional associations were consulted and encouraged to provide publicity and support for the program. Our cooperation with other bureaus has been for the purpose of influencing E.T.V., teacher education, and science curriculum development within the State.

Floor plans were prepared to show the facilities necessary in an Earth and Space Science laboratory including a list of necessary equipment and supplies.

The State is conducting inservice programs to develop resource teachers who can subsequently provide assistance and direction to their fellow teachers on the local level. The State then provides consultative services and support to these teachers through a cooperative program.

Equipment, Materials and Facilities:

There is a trend toward purchase of equipment which individual students can use in laboratory work. Preparation rooms, autoclaves, refrigerators, contrifuges, ripple tanks, etc. are necessary to many of the new course approaches.

Science enjoys an unrivaled amount of financial and public attention. Grants from NSF provide inservice education and opportunities for advanced study while equipment purchases are doubled in effect by the funds provided under NDEA. There is a marked increase in teacher and student use of laboratory equipment as reflected in the programs forwarded with NDEA applications.

With consideration provided for both the specialized laboratories of the secondary science subjects and the absence of formal laboratory procedures in the elementary school it is reasonable to assume approximately 40% adequacy of the programs that are appropriate to today's demands and provide experiences which will develop lasting concepts of the natural world.

Education:

Ten inservice workshops were conducted by the Science Consultant. These included work in elementary school science, earth science, biology and chemistry.

Equipment, Materials and Facilities:

The science consultant met with and advised several different planning groups involved in school construction and conferences with school superintendents, principals, and science department heads regarding the acquisition of science equipment and materials for their systems.

Equipment is acquired and is being installed in our new schools. The bulk of their equipment is for secondary schools. In FY 1966, 63.5% of the total amount of NDEA Title III funds actually reimbursed was for Science.

Curriculum:

During the fiscal year ending June 30, 1966, there was a greater demand for Title III, N.D.E.A. funds by local schools than any previous year since 1958 when the program want into effect. Ninety-six school districts out of a total of 108 submitted projects for approval. This is a 19 per cent increase in funds expended for science equipment, materials, and supplies over the previous years.

Education:

Eighteen inservice workshops involving some 630 participants were directed by the science supervisors during FY-66. These workshops were designed to up-date science teachers in new curriculum developments, methods, and available teaching materials.

In addition, numerous meetings and conferences with local supervisors, administrators, and teachers were held to determine: (1) the science program desired, (2) how such a program may be made possible, (3) provision of proper facilities, materials, and equipment, (4) evaluation of the program. More than 50 conferences or meetings involving over 500 persons have constituted this phase of the supervisor's activities.

Equipment, Materials and Facilities:

Not more than 10% of the elementary schools have equipment and materials necessary for carrying on an adequate science program.

Approximately 45% of South Carolina's secondary schools are properly equipped to provide adequate laboratory experiences for every student taking science.

SOUTH DAKOTA

Education:

Three full time people were employed on the elementary level for curriculum and field consultant services. Study guides were released for Science, Modern Math and Language Arts. Implementation of these was achieved by teachers institutes, teacher conferences and classroom visitations. The two elementary consultants met with over 90 teacher groups withan average teacher attendance of about 5,000. Elementary consultants spent about 300 hours in school classrooms meeting with over 700 individual teachers.

Evaluation:

Most schools report very favorably on aid received through NDEA. They indicate that assistance is received where it can best be used by the local school and that it is more truly a local program when their own money is involved.

Curriculum:

The aim of the Title III staff has been and will continue to be on "program" rather than "hardware." Title III funds have provided basic equipment and materials to a majority of our school systems. However, as programs are revised, additional equipment and materials will continue to be needed. New courses have been added to the curriculum, and Title III funds have provided the necessary equipment and materials for the laboratory programs.

Assisted many schools in curriculum evaluation and revision. Approximately 100 advanced science courses have been introduced over the last few years. The science supervisors worked closely, in most cases, with the schools planning to introduce new courses.

Education:

Continued work and finalized plans for publication in the near future of a junior high school science curriculum bulletin. Also, work was begun on a "Safety in the Laboratory" bulletin.

Equipment, Materials and Facilities:

Eighty-four new science laboratories, grades 7 through 12 were equipped this past year. Of the eighty four, forty eight labs were installed in existing buildings.

Evaluation:

A doctoral dissertation involving science faculties of fifteen local school systems selected for this study reported ways of instructional improvement through the utilization of Title III science funds.

In the opinions obtained from science teachers concerning the value of NDEA, Title III funds have revealed that the effects of this program have been most positive in helping to bring about:

> lesson presentation,
>
> improved science demonstrations,
>
> in providing more materials and equipment for individual pupil activity,

Improved conservation practices,

Changed scientific attitude,

Increased understanding of the economic value of our natural resources,

Increased understanding of scientific occupations,

Increased understanding of science in our daily lives,

Increased pupil scores on standardized tests,

Increased mastery of scientific concepts.

Also revealed in the dissertation was that supervisory personnel of eighty-two local school systems made a parallel study of science student changes. This parallel study was to report student improvements resulting from the utilization of materials and equipment purchased by NDEA Title III funds. NDEA Title III science funds have in the opinions of the responding supervisors:

Increased interest,

Scored higher on achievement tests,

Increased individual participation,

Used better laboratory techniques,

Worked independently,

Accepted greater challenges,

Increased experimentation,

Increased class participation,

Increased enthusiasm,

Created a better classroom atmosphere,

Aided in increasing the content of the science courses,

Provided more opportunity for laboratory exercises,

Aided in lesson preparation.

"The supervisory personnel of the eighty-two local school systems made a parallel study of instructional improvements by teachers.

NDEA Title III science funds have in the opinions of the responding supervisors:

Improved teacher instruction,

Created greater teacher interest in science,

Improved teacher demonstrations,

Made use of more materials and equipment,

Created a desire for more training,

Made possible greater use of audio-visual materials,

Aided teachers in lesson preparation.

"The secondary science staffs of the selected school systems reported student changes resulting from the utilization of materials and equipment provided by NDEA Title III funds. NDEA Title III science funds have in the opinions of secondary science staffs:

Increased interest,

Extended scientific evaluation,

Extended student knowledge,

Increased laboratory participation,

Increased understanding of the natural laws.

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* An Assessment of the Impact of National Defense Education Act Title III Funds Used for Secondary School Science in Tennessee (An Unpublished Doctoral Dissertation), Harley Stephens, University of Tennessee, 1965,

TEXAS

Curriculum:

The increased use of materials and equipment brought about more inquisitiveness on the part of pupils, encouraged students to make use of the scientific method in problem solving, increased pupil accuracy in observing and experimenting, helped strengthen skills and attitudes in problem solving, improved student interest and attitudes, improved performance and brought better testing results (a pilot study conducted in one of the junior high schools indicated pupil's test scores improved as much as twenty-five per cent by use of visual aids); and students developed greater appreciation for and understanding of these subjects. More individual work on the part of the pupils, greater effort of teachers to enrich the program, and wider use of supplementary materials were noted.

A further indication that improvement in science instruction in grades 1-12 has occurred in that at least six of our colleges and universities in Texas are now in the process of revising and upgrading the freshman courses in biology, chemistry, and physics. Texas schools now have the opportunity to use books developed from all of the national curricula studies in science at the secondary level.

Through the long-range planning for strengthening instruction in science at the seventh, eighth, and ninth grades by the Texas Education Agency science supervisors, eighty per cent ofthe seventh and eighth grade students in Texas have textbooks designed for life science and earth science for the first time.

Education:

Committees to advise on curriculum development in elementary science, biology, and chemistry and to help evaluate present inservice training for teachers of science are now being considered by the Agency overall planning committee, It is expected that the development of resource bulletins in these areas will begin shortly.

One hundred and sixty biology and earth science teachers participated in twenty-four clock hour inservice training in the respective subject matter areas under the direct supervision of the Texas Education Agency. School districts reported inservice training for an additional 500 teachers in the areas of elementary science, botany, astronomy, biochemistry, physical science and instructional media for science.

During the fiscal year 1966 the science staff was largely responsible for initiating the development of a professional organization for science supervisors of Texas. This organization has been effective in giving standards in earth science and physics and in establishing better communication between the State education agency and the many local education agencies.

The State science supervisors met with a committee of physics professors and a committee of earth science professors from the colleges and universities of Texas to plan better pre-service teacher education for these two respective fields of science. Outof these two meetings came proposals to increase the minimum number of hours of preparation for teachers of physics and earth science.

It is estimated that ninety per cent of the students in biology, chemistry, and physics have complete laboratories in which to work. About twenty-five per cent of the students have opportunities to do individual research problems above and beyond the basic experiments in the above three courses.

Evaluation:

A comparison study involving 2500 elementary school children in Texas at the fourth and fifth grade level was made during the year. A significant gain on the STEP achievement test was noted for those students who had teachers who had special inservice training in the use of the equipment and instructional techniques in science. Teachers of about 9000 elementary students were involved in the inservice program which was financed by NDEA, Title III funds. This program will be increased fourfold during the fiscal year 1967.

Curriculum:

There is a trend toward increased student laboratory work with respect to the degree of open-endedness and possible level of difficulty.

Education:

Inservice institutes have up-graded the competencies of some science teachers and pre-service teacher preparation programs in the granting institutions are focusing more on the nature of the total scientific enterprise--not on content alone.

In the area of curriculum, during an eight-week workshop, a student guide for the integrated chemistry-physics (chemics) course was developed, and these materials are being used by approximately 100 students during the 1966-67 school year. Also, an eight-week workshop in 7-9 science was conducted and a conceptual approach to the teaching of science in the junior high school was developed. The materials, when published, will be presented on key-sort cards which gives the program significantly greater flexibility, provides for individualized activities, and makes up-dating a relatively simple and inexpensive process. Those who participated will serve as resource personnel and in leadership roles in local districts and in individual schools.

An average of 32 teachers per week for each of four weeks during June and July, 1966 participated in Outdoor Education workshops in Ephraim Canyon. The basic purpose of the workshops was to prepare these teachers to teach students effectively in the out of doors and to develop concepts in conservation education.

Publications are resulting from the chemics and 7-9 workshops and the teachers involved in their development have made significant professional growth and have up-graded their teaching competencies.

Equipment, Materials and Facilities:

The per cent of adequacy of the science equipment and materials provided by NDEA, Title III are:

A. K-6 program:	40 per cent
B. 7-9 program:	50 per cent
C. 10-12 program:	70 per cent

VERMONT

Education:

NDEA, Title III Supervisory and Related Services resulted in the publishing of four newsletters plus information sheets which were distributed to all science teachers and school administrators developing preliminary quality standards for secondary school science programs, visiting of schools and assisting of teachers and administrators in improving their science instructional programs, and the review of science laboratory architectual plans for all new buildings in the state, and assisted school districts in determining scope and type of new science facilities for projected new schools.

Additional funds will be needed for workshops for inservice education of teachers to keep up with the growing trends in science.

Equipment, Materials and Facilities:

With the growing school population and the increase in school construction, there will need to be some $150,000 to $200,000 available annually for science under NDEA Title III. Maintaining existing science programs and remodeling to keep up with the expanding science curriculum innovations will require $100,000 annually for science under NDEA Title III. With the expansion of NDEA Title III into new critical subjects in 1965 with only a slight increase in appropriation, it was necessary for several schools to curtail their expansion of the science instructional program in fiscal 1966 and again in fiscal 1967 because of a lack of Title III funds.

Less than 5% of the elementary schools have laboratories facilities. No elementary schools have adequate facilities. Some $50,000 is needed annually to improve these facilities.

Curriculum:

In the laboratory classes many schools have sufficient equipment to permit students to work in small groups and in some instances on an individual basis in performing experiments.

In our judgment, NDEA Title III has provided an increase in opportunities for students to have more frequent use of laboratory equipment in their study of science subjects.

Education:

The high enrollment of elementary teachers in a short course on conservation indicates our teachers' interest in further preparation for the teaching of elementary science. Many project applications in both elementary and secondary science contained requests for science books to be used by students. The local school divisions have had many workshops and conferences to aid their teachers in the use of scientific equipment purchased under this program.

Teacher certification study is continuing and staff members have cooperated with the Division of Teacher Certification with this study. We have used the State Department of Education magazine: "Public Education in Virginia," to announce programs in science and to share information with science teachers and administrators; staff members have participated in state and national science conferences; contributed to the development of curriculum materials on challenges in space age education of the Southern States Work Conference; the NASA Spacemobile Program was scheduled for our schools during the second semester; staff members have participated in many science fairs, science symposiums, and science congresses and have noted with interest the improved quality of science projects and research papers; staff members have also noted an increase in the number of students attending high school summer institutes.

Staff members have conducted several inservice programs in elementary geology, laboratory techniques, demonstration techniques, chemistry and physics techniques. The secondary service sponsored a state biology conference for the purpose of acquainting the biology teachers with new trends in this subject area. Staff members have cooperated with the Bureau of Teaching Materials in recommending science films for purchase. These films have been sent to local schools throughout the state. Professional books for teachers and prepared materials for teachers use in science instruction have also increased.

Equipment, Materials and Facilities:

Educational television equipment requests increased for both elementary and secondary science project applications. More schools are participating in educational television programs this year over previous years. We have had a greater increase in requests for audio-visual aquipment than in former years.

Curriculum:

Intellectual growth of students does not lend itself readily to any quantitative evaluations; and the testing tools we employ are almost all oriented toward information retention and college preparation. We therefore have very serious reservations concerning the validity of offering test results as evidence of strengthened programs. The reorientation of teachers away from lecture demonstrations in favor of student-centered approaches is also largely intangible. Influencing of the manner in which teachers think and perform is one of the most critically important of the Science Supervisor's continuing objectives, and the results are far-reaching, though deceptively subtle. The general "climate" in Washington concerning science education has noticeably improved during the last couple of years. These changes are obvious in terms of administrators' attitudes, curricular efforts in local districts and the expression of a wide variety of teacher interests at conferences, workshops and informal meetings.

Growing interest in the new elementary science programs is another healthy symptom of the state of science education in Washington. This interest is largely due to the beneficial effects of NDEA, Title III. There is an obvious unwillingness to settle for a "status quo" situation, and the majority of our teachers and administrators are more receptive than ever before to educational innovations even though their implementation often involves considerable expense and no little inconvenience.

Nearly all of our senior high curricula now include several of the courses developed by national curriculum projects. Those who have chosen not to adopt BSCS Biology, PSSC Physics, CHEM Study, etc. have done so only after rather carefully conducted evaluations of their districts' facilities, staff competencies, equipment inventories and student needs. The "modern" programs have thus had a considerable influence upon science offerings even in those districts which have elected to retain the more traditional courses and materials. NDEA funds have been instrumental in the acquisition of equipment which has made the implementation of these programs feasible.

Education:

The Science Supervisor prepared and distributed four issues of the Science News Memo to some 2800 teachers and administrators throughout the State. This informal publication has served as a valuable means of communication between the State Office and educators in the field.

A special attempt was made to improve elementary science programs in outlying areas which receive very little supervisory assistance from local personnel through the implementation of a pilot type of elementary science workshop. Attendance was limited so that the group could be divided into three sections of less than 25 each in order to provide a maximum amount of opportunity for participation and interaction. Reactions to this "shirt-sleeve" approach were highly favorable, and many indicated they much preferred this type to the usual sort of professional meeting where the emphasis is upon talking, and teachers serve primarily as spectators.

It is our intention to organize a number of similar workshops in some of the more isolated areas of the State. Competent consultants from colleges, universities and other school districts will conduct separate work sessions where most of the activity is carried out by the teacher participants. We also want to involve at least one local teacher as a session leader in each workshop, so that we can gradually build up a reservoir of capable science teachers who can play a leadership role in a variety of future efforts to improve science programs throughout the State.

Equipment, Materials and Facilities:

NDEA funds have been matched with local district funds in the acquisition of the wide variety of instruments and equipment which are required by science classes in which the student is directly involved in actual investigations. A reasonable inventory or basic equipment is essential to a really effective sequence of science experiences.

Many districts are undertaking building programs to meet the needs of rapidly increasing enrollments, and it has been particularly gratifying to have many of these call upon the Science Supervisor for consultative assistance in planning new facilities and remodeling existing structures. Limited funds have been invested in installations which will efficiently serve students as practical work areas.

The following estimates are made regarding the adequacy of science equipment and materials now available to students in the public schools of washington:

Elementary	5-10%
Junior High (still far too oriented toward the teacher rather than the student)	25%
Senior High	80-85%

Education:

NDEA Title III-supported inservice science teacher education programs are organized and supervised by the local county school system with consultant help from the science supervisor of the State Department of Education.

The majority of inservice elementary workshops have two phases. During the first phase, teachers are carefully selected since they are to become future instructors. The instructor of the first-phase workshop is selected from the local school system on the basis of his experience and knowledge of recent curriculum trends and science instruction. He has usually attended NSF-supported institutes. Both the first-phase and second-phase workshops are of sixteen hours' duration, normally divided into eight sessions. During the second phase, some of the participants of the first phase become instructors, thus multiplying the effectiveness of the elementary inservice science program.

Secondary science workshops follow a different pattern in that they usually have only one phase. These workshops are designed to prepare teachers to teach (BSCS) Biology, (CHEMS) Chemistry or PSSC Physics.

The Science Supervisor served as consultant in the evaluation of science teacher preparation programs in twelve West Virginia Colleges and to Fairmont State College in organizing a curriculum and program to train teachers of modern Biology (BSCS). A Higher Education Act loan was obtained to implement this program.

The Supervisors of Science and Mathematics jointly prepared and distributed a Math and Science Newsletter for all science and mathematics teachers in the State. Separate issues were prepared for the elementary and secondary teachers.

Science...A Source Book on Recent Curriculum Improvement Projects was published and distributed to all secondary science educators in the Fall of 1965. This book is the fourth publication of a series developed with NDEA funds to serve as source books for science

Equipment, Materials and Facilities:

Approximately 30 per cent of the junior high schools and 80 per cent of the senior high schools are equipped with a laboratory facility. Approximately 15 per cent of these are adequately equipped. Virtually all improvement in both elementary and secondary school science facilities has been from NDEA Title III funds.

WISCONSIN

Curriculum:

Science teaching equipment in the secondary schools is very much improved over what it was at the initiation of the NDEA program. However, with the trend toward emphasis on individual laboratory work there is still a need for the special materials that are available. It is also true that the development of new curriculum projects has brought about the need for other types of equipment in the schools. Continuing support for the acquisition of equipment is needed.

Education:

Inservice programs operated through the NDEA section of the Department of Public Instruction have been very effective. Twenty-one workshops in science were conducted in local districts using NDEA funds and two non-credit courses were conducted through the cooperation of the science supervisor with personnel at the University of Wisconsin Extension Division. In the preservice training of science teachers in Wisconsin the only indicated change is the development of a program which will allow people training for elementary teaching to minor in special fields. This could have great implication for the problems of elementary science education.

During fiscal year 1966 the Science and Mathematics Newsletter which is a joint effort of the mathematics supervisor and the science supervisor was distributed to all science and mathematics teachers as well as all administrators three times, once in September, once in January, and once in April. Along with the April issue a report entitled the Status of Science and Mathematics in Wisconsin Public Schools was distributed. Too, a publication entitled "The Elementary Science Teacher's Handbook" was prepared and distributed to those elementary teachers who participated in NDEA sponsored workshops.

Science teachers in Wisconsin continue to improve themselves through further formal education and through inservice workshops.

Equipment, Materials and Facilities:

In the elementary school, as may very well be expected, there is a very great need for all kinds of science equipment and materials. The need is made greater by the fact that only recently has the need for an activity centered elementary science program been recognized. This is partially due to the new elementary science curriculum projects and partially due to an upgrading in the science preparation given to elementary teachers. The fact that an emphasis is being put on inservice training in elementary schools in which individual science activities and laboratory work are emphasized is also causing an increased demand for equipment and materials.

In the junior high schools the need for laboratory facilities is still quite great since in Wisconsin, as elsewhere, there is a tendency for newly established junior high schools to inherit the old high school facilities while the senior high school goes into a newly constructed building. Old science facilities have been remodeled and are quite good while others are sadly lacking. The availability of science teaching equipment and materials in the junior high school is approximately equal to that in the senior high school. Again, with the adoption of new curriculum projects such as Introductory Physical Science or the Earth Science Curriculum Project, there is an increased need for special equipment and supplies for individual laboratory work.

Laboratory facilities at the secondary level are very good and certainly evidence is seen everywhere of the effects of the NDEA, Title III increasing interest in science what was adequate one year is inadequate the next. It seems apparent in visiting school districts throughout the state that the level of science education which has been made possible by the NDEA program continues to be dependent upon NDEA support.

In FY 1966, more than ever before, the emphasis has been toward the purchase of equipment for laboratory use rather than large and expensive demonstrational items and furniture. This no doubt reflects the importance given to the processes of science and to inquiry and discovery in the current literature concerned with science education.

The National Defense Education Act, Title III has been instrumental in bringing about improvement. The acquisition program which has provided a large portion of the science equipment which is presently available in the schools has made it possible to pursue science education to an extent that could not be considered before. During fiscal year 1966, 48.89% of the federal funds available to Wisconsin through this Act were spent on science equipment.

Since the total federal support for this program has not been increased, the support for science programs has been seriously cut back. With the present system for allotting funds to local districts it has no longer been possible for the smaller districts to finance the furnishings of science laboratories when they are involved in building projects. The effect that this has had upon decisions to go into such projects cannot be estimated but it is certain that this change in availability of funds has influenced local decisions.

Curriculum:

If there is correlation between the quality of instruction and the availability of adequate materials and facilities, science instruction at the secondary level has been strengthened more than in any of the other critical areas. This is evidenced by the fact that the expenditures for science represented 54.5% of the State's total allocation for Title III. A major portion of this expenditure, or 47.3% of the total allocation, was made at the secondary level.

Education:

Instruction was improved as a result of workshops which were conducted on regional, county, and district levels. Participants were eager for and receptive toward new techniques and methods. The local educational agencies are becoming increasingly aware of the need for the revision and updating of the science curriculum at the secondary level.

Equipment, Materials and Facilities:

The per cent of adequacy, by subject area and level of the equipment and materials provided by this program is as follows:

(a) Elementary level - 25%
(b) Secondary level - 40%

These low percentages are primarily due to two factors:
(1) The relatively low allocation of funds to the State.
(2) The short period during which the State has participated in the Title III program.

Curriculum:

Consultants at the Curriculum Centers in Mayaguez, Ponce and San Juan helped teachers in these school regions to solve problems related to the teaching of the modern courses. Regional and State Science Supervisors assisted teachers in the teaching of these disciplines. Model classes were conducted to demonstrate the teaching of units in elementary and junior high school science.

A committee of biologists from University Centers helped in the revision of the translation to Spanish of the textbook Biology, green version. They worked on the translation done at the El Valle of Cali, Columbia.

The try out of units from E. S.T. was continued, and in addition a unit was prepared at one of the curriculum centers to offer special courses for teachers of science to prepare items to teach the new science curricula. A special sequence of courses was initiated at the University of Puerto Rico, at the Catholic University of Puerto Rico and the Regional College of Humacao with the participation of one hundred and twenty five (125) teachers. These teachers are ready to initiate the try out of the program Science - A Process Approach structured by A.A.A.S. Forty of the one hundred twenty five (125) teachers will be selected to work as instructors in the centers of study and supervision to train first grade teachers in the teaching of the new program.

Education:

Evidence of the impact of Title III Program in science education is the increasing demands from all school districts for seminars and other types of teacher's training. Approximately 5% of the elementary teachers and about 10% of the secondary teachers received training during the school year 1965-66.

Seminars were conducted for fifteen (15) chemistry teachers to train them in the teaching of the Chem Study course, twenty (20) physics teachers to train them in the teaching of PSSC physics, and twenty three teachers and supervisors of the Humacao School Region to train them in the teaching of the units structured by the Science Curriculum Improvement Study. At the University of Puerto Rico under the direction of a consultant to train ten (10) BSCS biology teachers in the teaching of the biology block, Animal Growth and Development.

Writing conferences were held at the San Juan and Mayaguez Curriculum Centers. One was held to prepare units of teaching for elementary science and the second was held to structure teaching units of BSCS biology, green version for Puerto Rico.

Equipment, Materials and Facilities:

From the sum matched from the Acquisition Program, science spent 38.8% for new laboratories, 20.4% for development of new curricula, 18.4% for elementary science classrooms and the rest was devoted to remodeling classrooms and to continue acquiring equipment to meet the minimum requirements for a laboratory.

Forty Three (43) new school laboratories were constructed and equipped this fiscal year. The laboratories equipped were: five (5) for the teaching of Chemistry, three (3) for the teaching of Physics, eight (8) for the teaching of Biology and twenty seven (27) for the teaching of General Science.

Laboratory experiences in the elementary and the new laboratory techniques and investigative procedures in the secondary school have demanded the remodeling of many science schoolrooms. Evidence of this is that fifty seven (57) out of seventy seven (77) school districts have at least one chemistry laboratory with adequate laboratory tables and equipment.

VIRGIN ISLANDS

Curriculum:

There have been school-initiated science exhibits in classrooms, on public bulletin boards, and open house displays at the close of the school year.

There has been an increase in student and teacher interest in marine biology, classroom experimentation with marine aquariums and teacher originated biology courses of study at the elementary and secondary levels.

Local public field trips have been carried out which include trips to St. Thomas, the desalination and power plant, the Dorothea experimental station on St. Thomas, Virgin Islands and the wild flower collection field trip in St. John, Virgin Islands were among those which were outstanding during 1965-66.

Education:

Sixty-five per cent of the elementary personnel received training in general elementary science; larger number received adequate training in earth science.

Principals and faculty members have shown increased interest in Science Youth Day, U.P.R. Summer Institute for advanced science students and NSF sponsored teacher institutes. Requests from the schools have increased for more and better science equipment in the Virgin Islands.

Equipment, Materials and Facilities:

All children from kindergarten through ninth grade in our public schools participated in the science program. Seventy-five per cent of the children from tenth through twelfth grade participated in the advanced science programs in the Virgin Islands. All secondary schools have the use of some science laboratory; eighty per cent of the elementary schools have adequate science equipment or science materials for daily experiences.

General and minor remodeling of science rooms in high schools, the biology room and chemistry laboratory at the Charlotte Amalie High School and multi-science room in the Julius Sprauve Jr. High School in St. John, Virgin Islands took up most of the efforts of the supervisor. This included the planning and equipping of science laboratories in the new junior high school in St. Thomas, and the new senior high school in St. Croix. Both the junior high school in St. Thomas and the Wayne Aspinall Junior High, will have two science laboratories and four general science rooms.

Science instruction is definitely improving in the Virgin Island schools. Signs of continuance along this line are in evidence everywhere.